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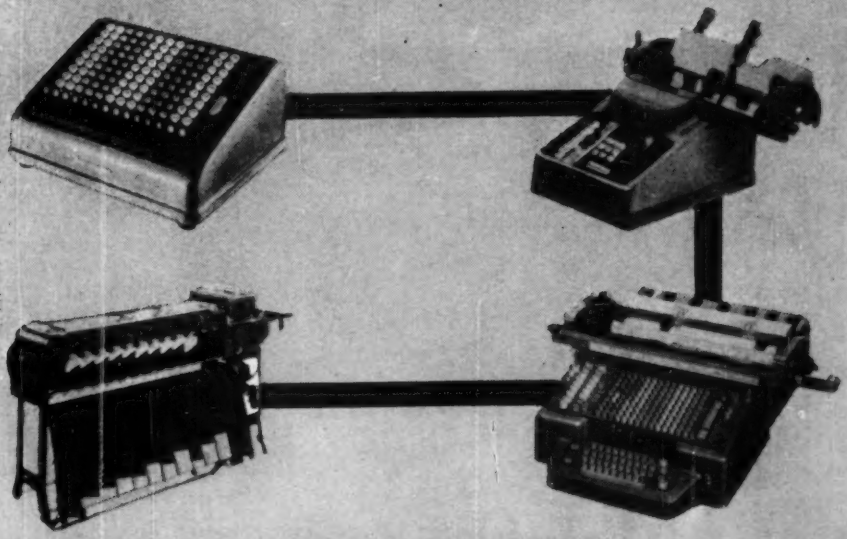
FEBRUARY 1951

BUSINESS · ENGINEERING · INDUSTRY

REPORT TO MANAGEMENT

Modern Machines and Methods— Management Tools for Business



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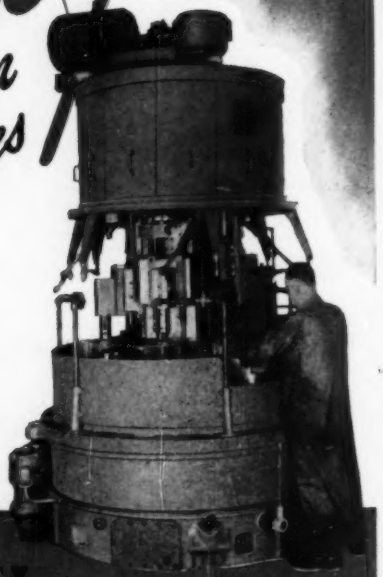
Accuracy plus economy on odd shaped pieces

. . on the Type "D" . .

BULLARD MULT-AU-MATIC



REPETITIVE ACCURACY

of Mult-Au-Matics is well known throughout the Automotive and other fields, where these machines have proven their ability to lower manufacturing costs. Here this thirteen inch six spindle type "D" Mult-Au-Matic is shown at work on an odd shaped piece. This is no problem, since work is chucked in a lying down position rather than hanging it up. Many other features of Mult-Au-Matics save time and lower manufacturing costs. Write for estimates on your work as applied to these machines. The Bullard Company, Bridgeport 2, Conn.

BULLARD

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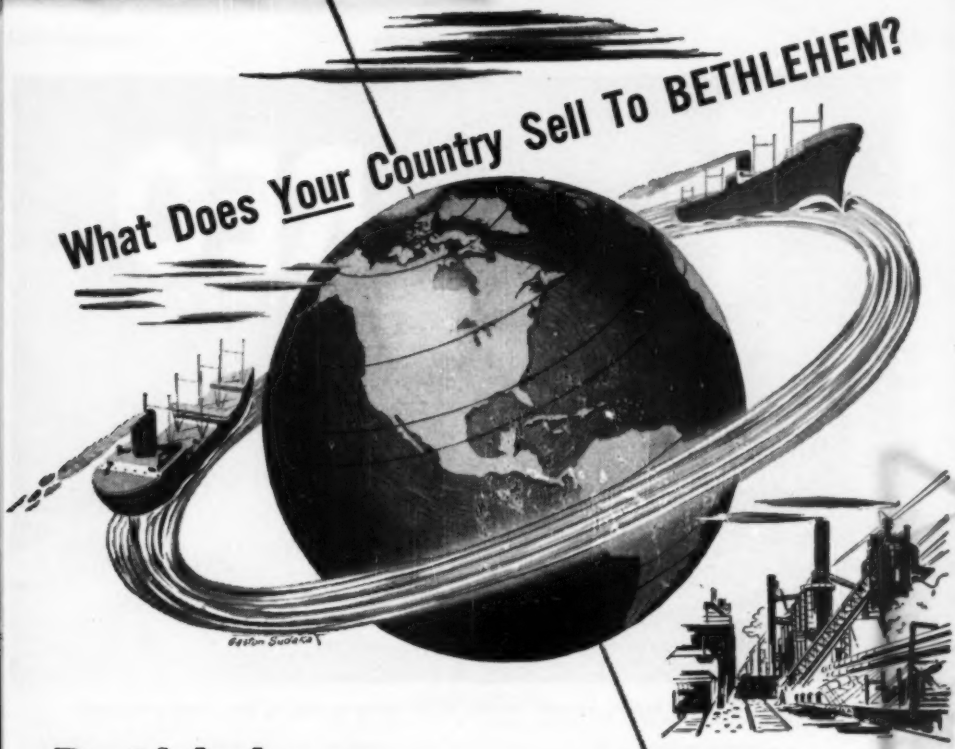
What Does Your Country Sell To BETHLEHEM?



Bethlehem Buys from 41 Countries to Supply the World with Steel

YES . . . it takes a world of products to make a ton of steel! In order to produce the multitude of steel products now in such great demand throughout the world, Bethlehem buys a wide variety of ores, chemicals and supplies from sources outside the U.S.A.

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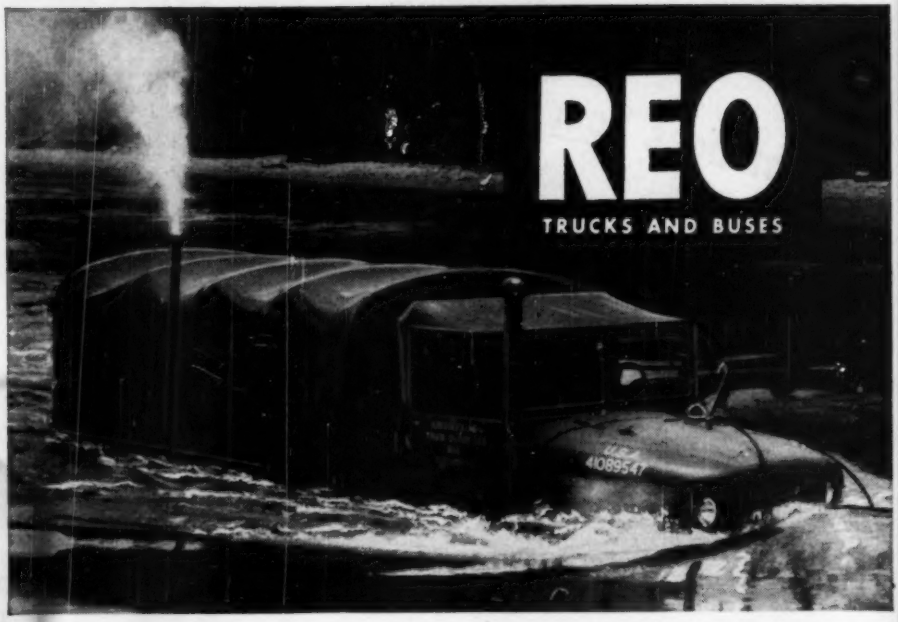
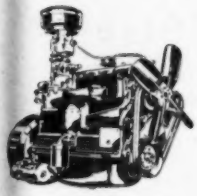
BETHLEHEM STEEL



The Reo Gold Comet Engine, actually cruising under water in tests by U.S. Army's engineers.

Proof of Gold Comet Engine Performance



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REO
TRUCKS AND BUSES

McGraw-Hill DIGEST

VOLUME 6
NUMBER 2

Member—Audit Bureau of Circulations

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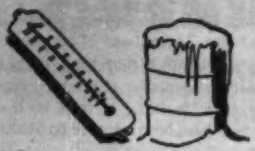

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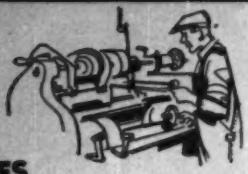

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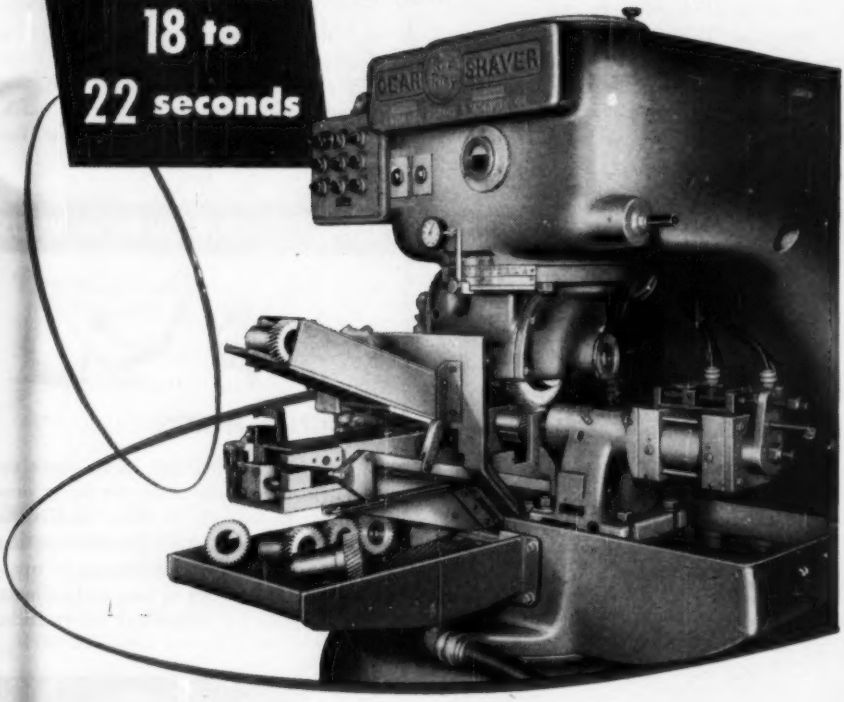

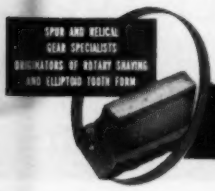

WRITE FOR DESCRIPTIVE LITERATURE ON RED RING GEAR SHAVING AND AUTOMATIC LOADING

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Business Trends

FAST MOBILIZATION—that is the program here. U. S Armed Forces are already nearly double their pre-Korea strength, will grow to about 3.5-million men by mid-1951.

U. S. military expenditures are now growing at about the World War II rate—roughly doubling every 6 months. The rate of military spending, now $17-18 billion a year, is expected to reach $25-30 billion by midyear, $50-60 billion by the end of 1951.

The defense program aims at full preparedness by 1952. For 1952, planned strength of the Armed Services is about 5-million men, military spending should reach the neighborhood of $75 billion.

Mobilization falls heaviest on the mtalworking industries—government goal is to put them on a war basis by this fall. The U. S. supply of key materials will be split up between weapons, stockpiles, essential civilian goods, and essential exports.

That means civilians will get less of all products made of metal. Makers of electrical appliances were hit first; they expect first-quarter production to be about 75% of the total for the last quarter of 1950. Durable goods will taper off more gradually as the military program gathers speed.

Here are some estimates of how civilian production will decline in 6 months—between December 1950 and June this year: passenger automobiles, 33%; refrigerators, 30%; television sets, 50%; home radios, 33%. Other parts of the economy will be effected indirectly. For instance, housing may be cut by shortages of furnaces and other metal products.

Bad international developments could change this schedule, make the cuts bigger. But if the international outlook improves, cuts will not be any smaller. The U. S. will mobilize anyway.

BUYERS OF U. S. EXPORTS will get less goods this year because of metal shortages and defense orders for other products. Here is the outlook for various products of interest to foreign buyers:

Electrical appliances—With the U. S. cutting production 25% or more, prospects are bleak but at least one big company says it will reduce exports by no more than the over-all fall in production.

Chemicals—Defense makes big demands on chemical industry, so more and more of total output will stay at home.

Plastics—U. S. demand is huge. And styrene, which is basic for plastics, is needed for the growing synthetic-rubber program.

Steel products—As U. S. mobilization is speeded up, more and more steel will

Business Trends (Continued)

go into rearmament. So the prospect is that exports will be still lower later in the year.

One hope for foreign importers: some leading U. S. companies will try to distribute cuts evenly. Foreign sales will be reduced by the same percentage as domestic sales. And the U. S. government still wants to protect essential exports. (McG-H Digest, Nov. '50, p 17).

U. S. STOCKPILING adds to world demand for scarce metals. Heavy government buying is putting extra pressure on prices and supplies. Appropriations for building stockpiles have doubled and redoubled since Korea. Government stockpiling agencies have as much money for 1951 as in all previous years.

With a goal of $3.7 billion in strategic materials, the stockpile program was only 42% complete last June. Agencies have $1.1 billion to spend during fiscal 1951. What this will buy, combined with material already ordered but not yet delivered, is expected to bring government supplies to 85% of the goal by next June, when the fiscal year ends.

Stocks of some materials—lead, quicksilver—have reached the original goals. But others, vital in wartime, are still far behind. Among the most important are copper, tin, manganese, aluminum, tungsten, rubber. Demand for strategic materials is not expected to ease either this year or next.

Many current stockpile orders will not be filled until late in the year—deliveries lag 3 or 4 months. And stockpiling will go on, particularly in materials for jet engines and guided missiles. Reserves of some of these materials—columbium, chromite, and others—are considered far too low for safety.

U. S. stockpiles are designed to meet the needs of a 5-year war. The plan is to build stocks of key materials produced outside the Western Hemisphere. Stocks must be big enough to cover the difference between war-time consumption and what the Western Hemisphere can produce.

With Communism posing a growing threat to Far Eastern sources of supply, the U. S. needs its stockpiles more than ever. So buying will continue, even though it keeps prices high and hurts consumers everywhere.

RISING DEMAND for key defense materials is forcing Washington to plan stronger controls on civilian use of strategic metals. Across-the-board cutbacks and piecemeal allocation are at best stop-gap measures.

Controlled Materials Plan, similar to that of World War II, is part of long-term planning. Theory of CMP is that production of most durable goods depends on three major materials: steel, copper and aluminum. To control durables industries, the government will channel these basic metals, and perhaps others, direct to essential users.

ENGINEERING THINKING
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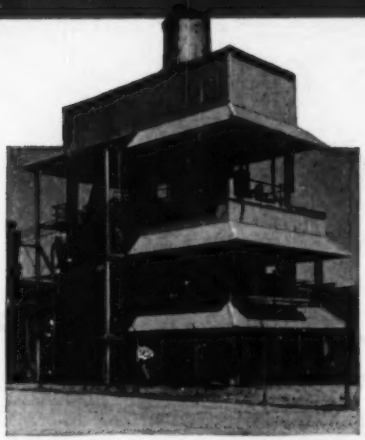

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A picture tour of Bliss Presses in action at various General Electric Company plants

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Illustrated here are but a few examples of specially engineered Bliss equipment at work in various General Electric Company plants. Thousands of others are producing profits for leading manufacturers the world over.

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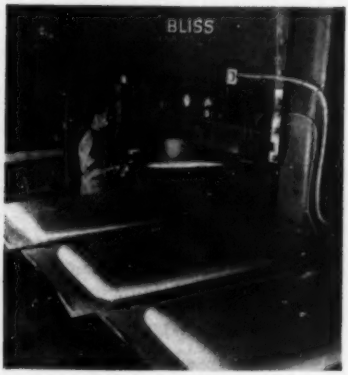
Next time you need advice on metal-stamping production, call your Bliss representative. He will welcome the opportunity to be of service.



AT ERIE, PENNSYLVANIA: Doors for home refrigerators are drawn in this 350-ton Bliss "E" type straight side press equipped with Bliss-Marquette die cushions.

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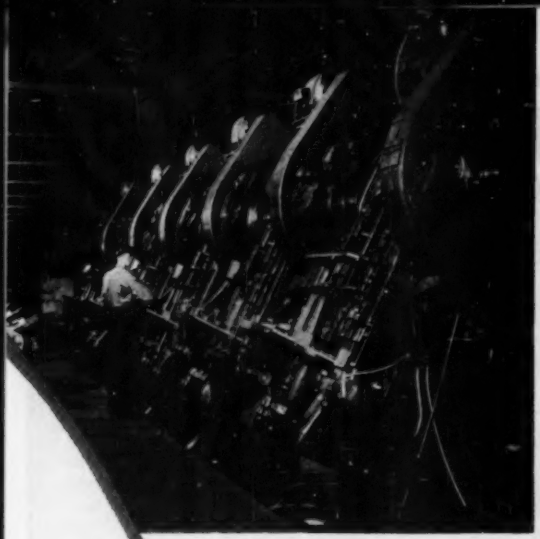
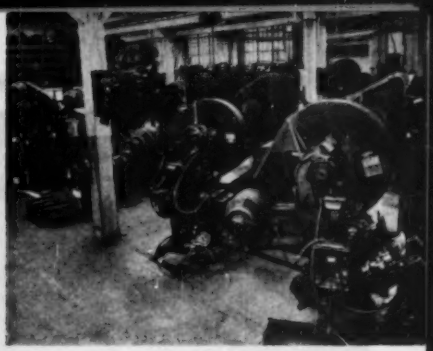
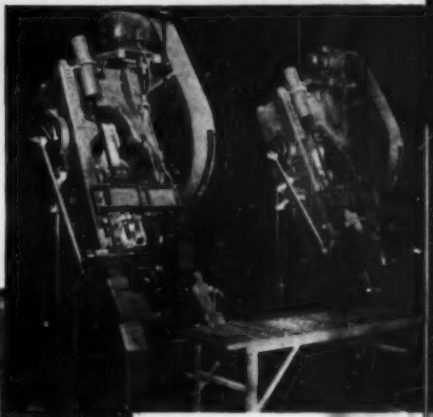


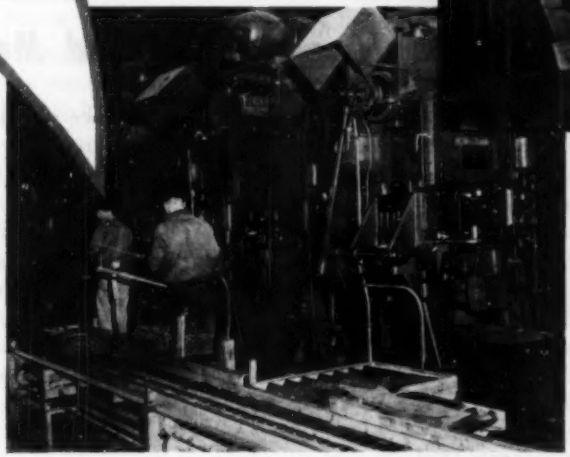
AT TIFFIN, OHIO: Hermetic refrigerator motor laminations are repunched at high speeds in two lines of Bliss Special No. 304½ presses.



AT SCHENECTADY, NEW YORK: These batteries of Bliss Inclinable presses are used for a variety of metal-forming operations.



AT SAN JOSE, CALIFORNIA: Two of several specially designed Bliss straight side presses in fixed inclined position have stack feeders. Rigid press construction is vital for precision lamination punching at high speed.

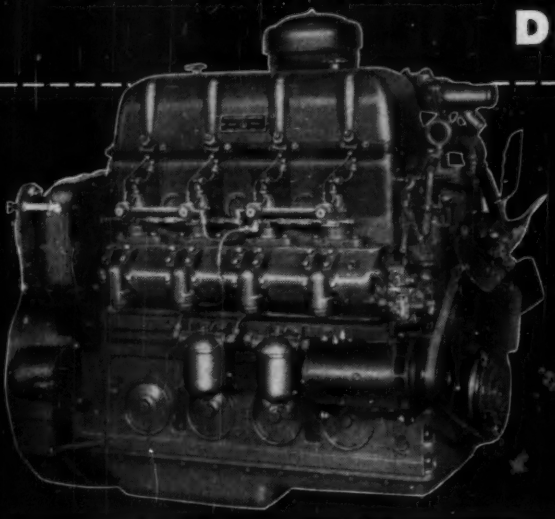


AT DANVILLE, ILLINOIS: Two lines of Bliss High Production presses with progressive dies produce laminations for fluorescent lamp transformers. All were designed with high legs to accommodate material equipment.

FROM THE RIGHT PRESS FOR A GIVEN JOB . . . TO A COMPLETE PRESS ROOM . . .

It's Bliss

FAIRBANKS-MORSE MODEL 49 DIESEL



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Washington Report

THE UNITED STATES is fully committed to garrisoning the free world from the Rhine to Japan. The issue of war or peace rests, as it always has, with the Kremlin. But now each day that passes will find the West better prepared.

Will Europe pull its own weight? That question is heard a lot around Washington. Some observers believe the only effective defense now is one centered in the U. S. itself. Isolationists, who got a new lease on life after last fall's defeat in Asia, are speaking out now.

Will the U. S. precipitate a war unnecessarily? That question is heard a lot from European diplomats. They fear the fact that war and occupation have never been brought home to the U. S.

As a political force, these fears are dangerous as long as the West is weak. But as strength begins coming off the production lines on both sides of the Atlantic, opponents of a common front against communist aggression will be fewer. That, at least, is how official Washington is talking.

A diplomatic showdown with Russia is sure to prelude any shooting war. One last Four-Power meeting will probably be held this year if the Russians are willing. The three Western powers will ask to review the whole list of East-West problems. Russia, so far, has indicated only that it is willing to talk about Germany.

Washington officials hold little or no hope that another conference will produce any results. But for sake of removing doubts abroad and persuading neutrals to take sides, another try is almost inevitable.

GOVERNMENT BUYERS will dominate most of the world commodity markets before this year is out. Officials see no other way of insuring a steady flow of vital raw materials to the industries of the North Atlantic area.

International commodity agreements require a long time to negotiate. Producers now are in strong bargaining position, unlike in 1942 when Anglo-American control of the seas allowed the two big allies to name their price.

Producers are asking for minimum-price guarantees, assurance that they can get essential imports from the West, and price control on the imports they need. Chances are they will get these concessions in most cases.

Agreements will be sought this year on a whole host of items, including wool, tin, copper, rubber, nonferrous metals. some industrial chemicals, and maybe some consumer items like coffee, tea, and spices. These negotiations will take months. Where possible the negotiations will go on within existing international commodity study groups, such as now exist for wool, tin, rubber, cotton, wheat, and sugar. Study groups for copper, lead, and zinc may soon be formed. U. S. bulk buying of many items will be in effect before any of these agreements are

Washington Report (Continued)

worked out. Rubber is already a government business. Next may come tin and copper.

A combined raw materials board for the Western World is being formed, but it will take a long time. The British wanted to have the U. S., U. K., and France do the job of splitting up the various commodities. The U. S. objected. Washington thinks Latin America, Asia, Western Europe, and the British Commonwealth should all have a part. Some high authority is likely to be set up, but the real controls will be worked out among the interested parties on a commodity-by-commodity basis.

EQUALITY OF SACRIFICE is the theme of the Western Hemisphere meeting this month (February). The U. S. is out to persuade Latin America again that it must make sacrifices for Western rearmament. As in World War II, the U. S. will promise equal treatment of the Latin American market and the home market. But there will be no doubts that U. S. exports to Latin America face a sharp reduction.

The dangers of inflation in Latin America have U. S. officials worried. The State Department is losing no opportunity to emphasize the need for strict controls. Most Latin American countries suffered badly from failure to do this during World War II.

More strategic materials from Latin America is another objective of the meeting. The U. S. gets all its vanadium, quebracho, and castor oil from South America; from 75-90% of its imports of petroleum, beryllium, bismuth, copper, and iodine; and from 40-75% of its sisal, tin, lead, zinc, and tantalite. Increased output of these and other commodities is needed despite the cutback in U. S. exports.

The U. S. will renew its pressure on Brazil to make use of its oil reserves. Getting fuel to Brazil promises to be a tough problem when shortages really begin. The U. S. will tell Brazil that it will get little sympathy if it continues to sit on its own reserves.

AID TO ASIA—that part of it not directly threatened by Communist China—will get a big boost this year. Aid is primarily needed to finance public-works projects. Private capital is virtually ruled out as a likely source of financing. So the State Department has a $2-billion, 5-year program prepared to fit in with the $5-billion Colombo plan of the British Commonwealth.

India is the principal target of both programs. The drawback is that India needs vast foreign aid to buy consumer goods, mostly food, and to cover local costs of development projects as well as for development goods. U. S. aid programs have never covered these items. Congress is not likely soon to approve of spending taxpayers' money that way.

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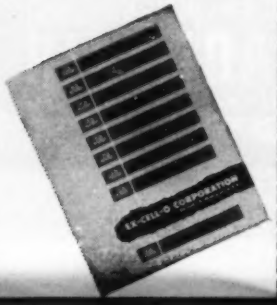

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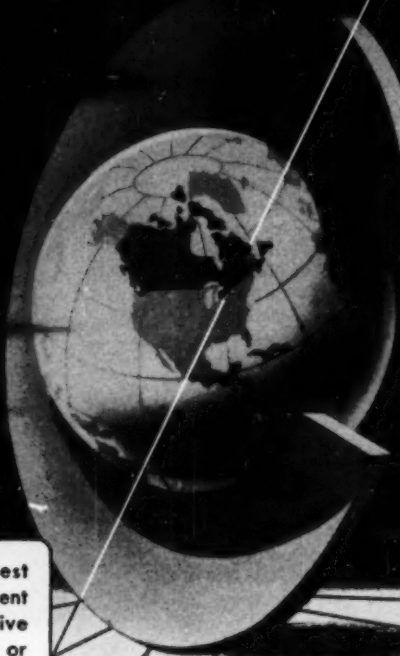

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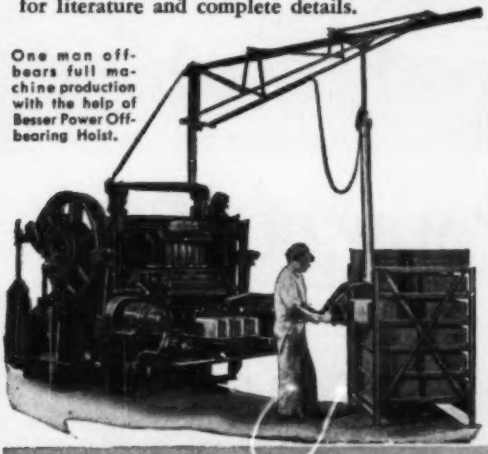

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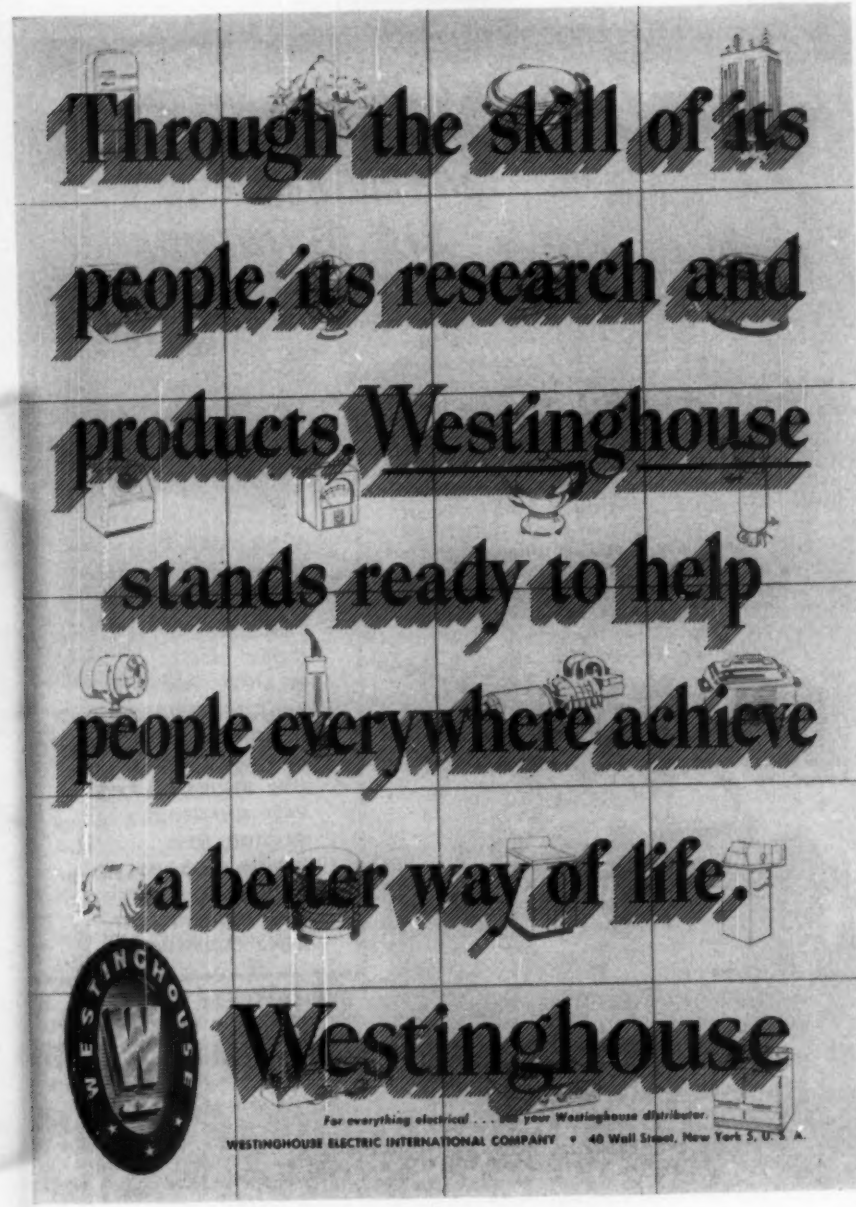
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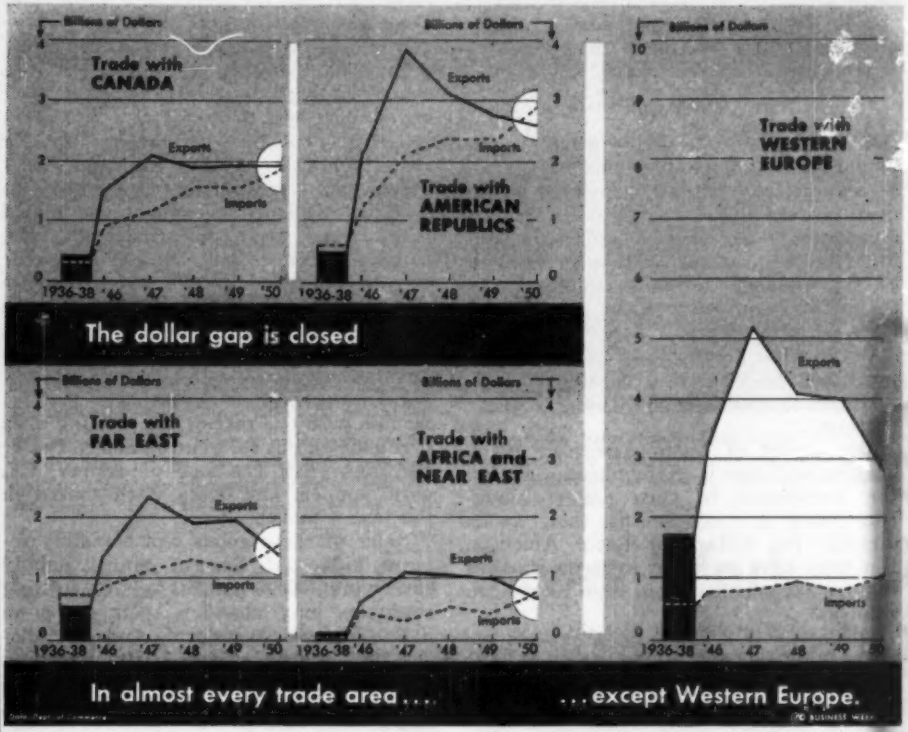


U. S. Strikes A Trade Balance

For the first time in 13 years, the U. S. imported more than it exported. Result: Triangle trade pattern returns. Rearmament may end it for Europe

RED CHINA'S INTERVENTION in Korea makes the end of the world dollar shortage a practical certainty. As the U. S. steps up its arms drive, the dollar gap will vanish.

During August, for the first time since 1937, the U. S. imported more than it exported. Another thing happened: the prewar pattern of triangular trade came back—at least temporarily. Instead of getting dollars only by selling direct to the U. S., Europe can now get them by selling to third parties who have a surplus.

Latin America, the Far East, Africa, and the Near East sold more to the U. S. than they bought. This gave Western Europe a chance to earn dollars from its exports to these regions.

Behind the shift in U. S. trade balance are two significant facts:

1. Three-quarters of the change from

surplus to deficit was due to a slump in U. S. exports; one-quarter of it came from an increase in imports.

2. More than half the rise in third-quarter imports was due to heavier U. S. buying in Latin America.

Why U. S. Export Dip

The drop in U. S. exports had begun to narrow the dollar gap long before the Korean crisis. Several things led to the dip: (1) industrial recovery in Western Europe; (2) currency devaluations, giving European goods a price advantage; (3) severe curbs on dollar imports; (4) the attraction of the home market for U. S. manufacturers.

Aside from helping to narrow the dollar gap, the rise in U. S. imports has restored in part the multi-lateral trade pattern.

One result of Latin America's trade surplus with the U. S. has been a chance for Europeans to earn dollars there. Europeans are not selling their goods directly for dollars in Latin America. But they have payment agreements that require settlements from time to time in dollars.

As far as U. S. trade goes, experts see nothing in the months ahead to change the new balance. If enough goods can be found abroad, U. S. imports may rise even more in the next 3 or 4 years. Developments within the U. S. economy will keep its foreign trade in balance. Import demand will be kept high and exports limited.

For Canada, Latin America, and Africa, the dollar shortage is over. Southeast Asia will be in the same position unless the communists take over.

The uncertainty lies in Western Europe. Until rearmament gets going, the European trade balance should continue to improve. ERP countries ought to be able to sell more of their goods directly to the U. S. At the same time, they will probably boost their dollar earnings in trade with Latin America.

But if mass rearmament hits the ERP countries, dollar deficits certainly will show up again. Arms aid would not make up the difference. Europe will need much larger imports of both dollar and non-dollar goods.

European exports will probably fall. Much of their productive capacity will have to convert to defense. And some potential exports will have to satisfy rising consumer demand at home.

A large rearmament program in Europe would probably mean the end of the revived triangular trade pattern. Europe will have only limited goods for export, while demand for raw materials is going up. Thus it cannot have trade surpluses with raw-materials producers. That means the end of dollar earnings in Latin America.

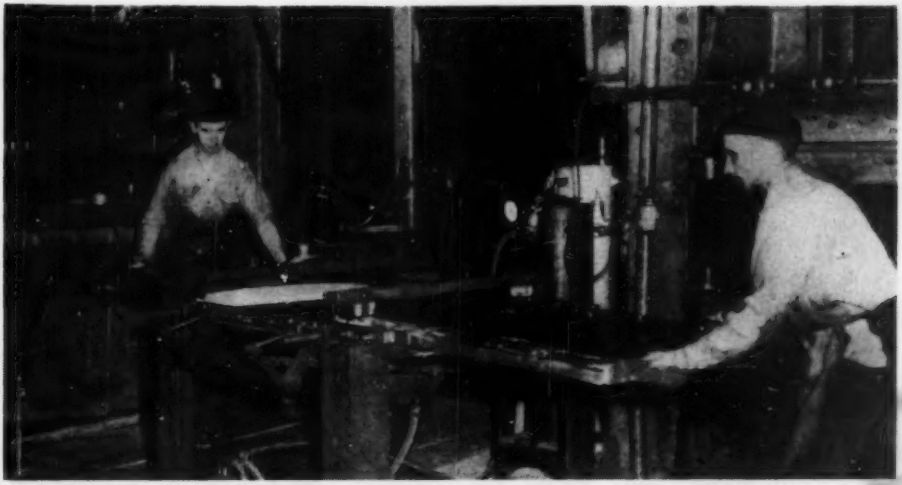
Britain, in fact, could get in real trouble with the rest of the sterling area if it goes all out for rearmament. Dollar earnings from the sale of rubber, tin, wool, copper, and cocoa have soared in the last 6 months.

Sales of these goods will certainly remain high. If Britain cannot supply their import demands, some sterling countries may abandon their curbs on dollar imports in order to soak up inflationary buying power. By spending their dollars directly, rather than turning them over to the Bank of England, these countries could weaken the ties that hold the sterling area together.

Allocation and Price Control

One thing that would lessen the strains on the sterling area would be international allocation and price control of tight raw materials. But the basic situation would not change much.

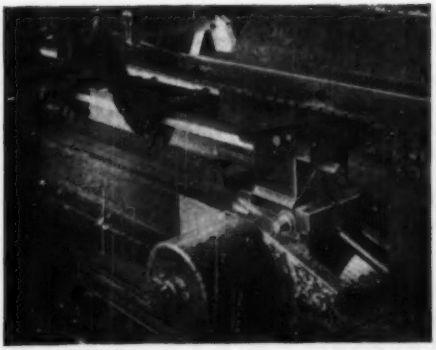
Thus the triangular earning of dollars by the ERP countries, particularly in Latin America, is not likely to continue beyond spring. And that means that the Western European countries will need and probably will get continued American economic aid—apart from arms aid (McG-H Digest, Jan, p22).—Business Wk, Dec 9, p101



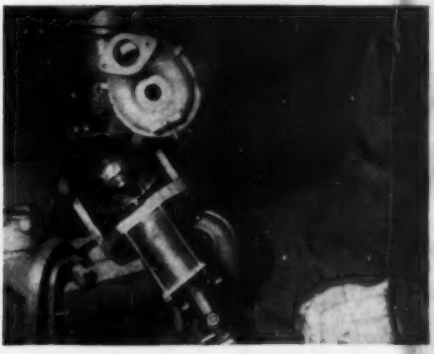
***REMOVING BULGES** in steel refrigerator door is a quick, easy job for compressed air. Press table has one fixed side, one movable side. The movable side is controlled by linkage attached to an air cylinder below table. That makes it a clamping device. A push of a pedal operates cylinder and flattens bulges in door. Man at left pushes door across press table.*

Compressed Air Saves Work

In each method pictured, compressed air has helped to cut costs and boost production. Have you tried it in your plant?—Factory, Dec, p110



***HOLDING** aluminum channels during a stretching process is done by a compressed-air actuated clamp. Clamp was formerly tightened by hand. A 2½-in. cylinder applies pressure.*



***POSITIONING** burners for hole-boring operation is easy for air-operated fixture. Piston forces burner against fixture head. As each hole is bored, burner and cylinder turn.*

TUBES are easily replaced in electronic control unit.

AMPLIFIER WIRING is punched out of sheet brass with webs between circuits. Webs are snipped after joints are soldered.

Electronic Heating Control

New electronic control system maintains room temperature within ¼° F. by sensing outdoor temperature changes and cycling burner

ULTIMATE GOAL for home heating systems is to supply constantly just enough heat for the building to balance heat loss—no more, no less. The result is an even room temperature.

The introduction of electronic controls gives results never before believed practical. Whereas typical bimetallic thermostats are adjusted to have a minimum differential of 1½-2° F., electronic controls can maintain room temperature within ¼° F.

The electronic heat-control system developed by Minneapolis-Honeywell Regulator Co. consists of a Wheatstone bridge arrangement, an electronic amplifier, and a relay. Operation sequence is this: Signals are picked up by bridge elements and amplified. Electronic amplifier provides a signal voltage for the relay whose output circuit can operate any common heating system employing an oil burner, gas burner, or stoker.

One leg of the bridge has two resistors in series— a master thermostat and an averaging thermostat. A rheostat in the same leg is integral with one of the thermostats and acts as a control-point selector.

In another leg is the outdoor anticipator resistor. This gives a signal as the outdoor temperature changes, thereby

starting corrective action before the room temperature varies.

The value of this resistance may be selected so the control point is automatically shifted to give a slightly higher room temperature as the outdoor temperature falls. Raising indoor temperature as outdoor temperature falls reduces radiation of body heat to cool walls and adds to comfort.

Bridge output feeds to a two-stage voltage amplifier having two triode sections of a 12SL7 tube. The amplifier feeds one half-section of a 12SN7 tube, whose plate circuit operates the relay. When the bridge circuit is unbalanced enough to produce 45 volts dc. across the relay, the relay pulls in and establishes a circuit to furnace controls.

Plate supply voltage for amplifier is 315 volts a-c. A large capacitance is placed across the relay coil to smooth out a-c. ripple and prevent chattering.

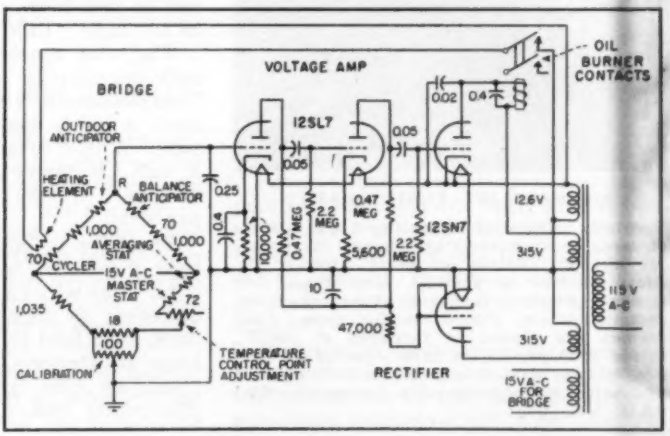
But to keep room temperature as uniform as possible, the heating system should provide heat in as many burner cycles as practical. This avoids overshooting of the system and consequent overheating of the room. A minimum cycle of 3½-5 min. gives good results in most domestic heating plants.

The automatic cycling of the electronic control system is provided by a heating element near the bridge. When the burner is turned on, the heating element throws off heat that increases the resistance of an element in the bridge.

The increase in resistance helps to balance the bridge, thereby opening the relay and turning off the burner before the room temperature over-shoots. The heater at the same time is deenergized, and the bridge element cools. When the element reaches the temperature of the surrounding air, the bridge is restored to its original unbalance and the relay again closes to repeat the cycle.

As the resistance of the cycler increases and decreases, it tends to balance and unbalance the bridge circuit periodically, even though there is no change in temperature at the thermostat. A cycling rate for the burner is thus automatically established.

But when the outdoor temperature falls, the cycling rate changes because of the outdoor anticipator resistor. Electrical resistance of the outdoor anticipator decreases as the outside temperature drops, and unbalances the bridge circuit. The on-cycle of the burner increases and off-cycle decreases. Room temperature fluctuations are practically unnoticeable.—Electronics, Dec, p84



***CIRCUIT DIAGRAM** for new home-heating control system has three basic elements: Wheatstone bridge, electronic voltage amplifier, and rectifier. Various elements in the bridge circuit are provided to pick up signals, with resulting unbalance fed to the voltage amplifier and to the relay that operates furnace burner controls. Oil burners, gas burners, or coal stokers can be controlled by this unit.*

Pavement-Design Study Finds Expansion Joints Unnecessary

For the past 10 years the Michigan State Highway Dept. has been conducting a pavement-design study. Here are some of the results of a report recently issued:

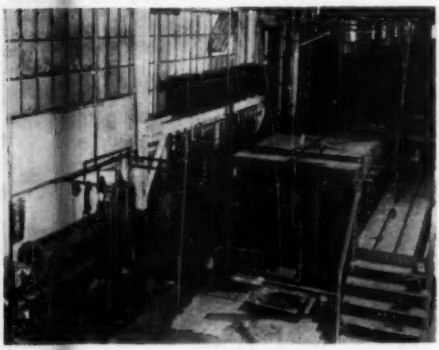
1. Expansion joints are unnecessary except at intersections, rail crossings, and structures.

2. Adequate load-transfer devices are essential in all joints.

3. Continuous plate dowels are not satisfactory as load-transfer devices.

4. Contraction joints formed by grooving the pavement surface and filling the groove with a sealing compound is superior to inserting a pre-molded bituminous fiber strip.

5. The commercially available asphalt-rubber joint-sealing compounds have greater durability than mixed-on-the-job asphalt-latex mixtures and are superior to the straight asphalt or tar products.



ANNEALS JET-ENGINE PARTS

Carefully controlled annealing cycle relieves stresses in stainless-steel frames for turbo-jet aircraft engines at Solar Aircraft Co. Close control is possible with these two General Electric furnaces of top-charging, rectangular-pit, ribbon-resistor type. Four frames are placed in furnaces at 500°F., raised 100° per hr. to 1650°, cooled at 200° per hr. to 500°, then removed stress-free and with no objectionable oxidation.—Elec C&M, Nov, p121

6. Mechanical tamping of soil under forms produces more positive results than hand tamping.

7. Nothing has been learned that would definitely indicate that short-slab construction is better than long-slab construction.—Eng-News Rec, Nov 16, p38

Venturi Blowers Move Chips

Chips are handled at the new Chicago Screw Co. plant by a pneumatic system that requires only four men per shift for its operation. Quantity handled will be 7,500 tons per year.

Chips after crushing and centrifuging are moved by venturi nozzles suplied with air at 5 psi. Supply lines from blowers to nozzles are 6-in. pipe, while delivery lines to storage bins and outside hoppers are 5-in. pipe.

Chips in the delivery lines reach speeds up to 5,000 fpm. Turns in lines are made of one or two 45°, 24-in. radius elbows to provide gradual curves. Cast elbows, chilled to 600 Bhn., have 1-in. thick walls to withstand abrasive action of passing chips.—Am Mach, Oct 30, p96

Wire Laid at High Speeds

New type of field communications wire has been used successfully in Korea. It can be laid from airplanes at speeds up to 120 mph. Talking range is 12½ miles.

The wire consists of two conductors, each individually insulated and jacketed. The conductors are twisted together to form a light, flexible, flat-lying twisted pair. A thin covering of nylon provides a tight water-proof container for the strands. Weight of the wire is 46 lb. per mile.

The wire is laid from a canvas and tape dispenser, which holds ½ mile of wire. The wire can be released from the dispenser by packboard from a soldier's back, from land or amphibious vehicle, or from an airplane. It can be shot over rivers by rifle, grenade, or bazooka.—Electronics, Dec, p134

New Oil Wells Designed for Earthquake Protection

Two earthquakes in the last 3 years in California led to an oil-well design that would prevent or minimize damage from the earthquakes and at the same time make repair easier and cheaper.

The method consists of providing a larger-than-normal hole around the casing. Purpose is to prevent transmission of formation movement to the casing or to spread the deformation resulting from such movement over a sufficient length of casing so as to avoid severe damage.

About 200 ft. of 30-in. OD, ⅜-in. wall slip-joint casing is set and cemented. Then a 26-in. hole is drilled to several hundred feet below the lowest known slippage plane. The resulting annulus between the formation wall and the 7- or 8⅝-in. casing is filled with material suitable for preservation of the annulus.

The filling material is an emulsion-type mud treated to obtain a low water loss and an extremely high gel strength. After complete gellation, mud consistency is such that a pencil thrust into it will remain upright. The strength of the gel is measured by a specially modified shearometer tube.

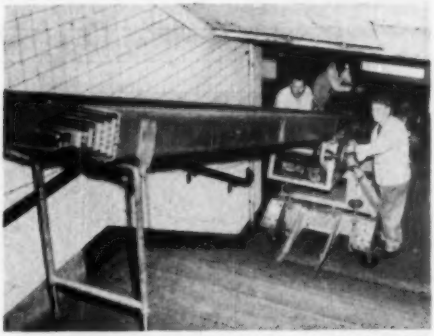
After the annulus is filled, the well is completed in the normal way.—Oil & Gas J, Nov 23, p62

Car-Wheel Unloader Chute

A wheel chute built by the Southern railroad has reduced the time required for unloading wheels in box cars from one car every 2 days to two cars per day.

The chute is mounted on four steel rollers. With the the chute placed next to the car door's opening, the wheels are rolled from the car floor into the chute; they then roll by gravity to ground level for further handling.

The chute is lined with two pine boards, one on each side, to act as retarders for controlling the speed of the descending wheel. The retarding force is varied by six crank-handle jack screws that squeeze the two planks together.—Railway Mech & Elec Eng, Dec, p727



REACHES TO THE STREET

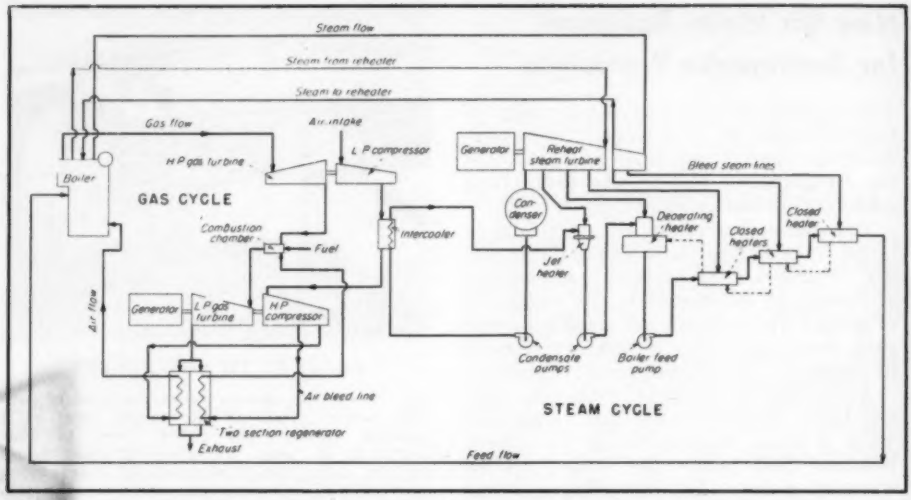
New York City bakery faced the task of getting baked goods to the lower level of a subway station—the stairs were in four flights 93 ft. long. Carrying by hand would be too slow, so this portable telescoping inclined belt conveyor was built for the job. When stored in subway store room, it is 18 ft. long. Wheeled to stairs, it is extended by power to full 93-ft. length. Belt winds on reel when conveyor is retracted.—Food Ind, Dec, p45

How to Dry Wet Belts

If wet leather belts are dried too fast, the leather will crack when bent. The reason is that oak-tanned leather containing oil or animal fat in only small quantities burns at 80° F. when dried too fast.

After a belt is soaked, it should be painted inside and out with a light coat of neat's-foot oil, cod oil, or belt dressing. Then the belt should be dried slowly and at moderate temperatures, preferably at 60° F. and never higher than 80° F.

If the drive cannot be shut down long enough for drying the belt properly, the belt should not be run until its surfaces have been treated.—Oper Eng, Dec, p33



COMBINES GAS-TURBINE AND STEAM-TURBINE CYCLES

In operating a gas turbine, fuel is burned and then the gases are cooled before they enter the turbine so the metal can stand the temperature. Cooling is now done by adding excess air during or after combustion, thus cooling the gases without doing any work. But in this suggested gas-turbine and steam-turbine combination, cooling would be obtained in steam generation. Furnace boiler would have to be pressurized. Design calculations by Burns & Roe, Inc., indicate a 10-14% gain in thermal efficiency over corresponding steam cycle without the gas turbine. Combination cycle could, as calculated, deliver 1 kw.-hr. for 8,420 Btu.—Elec World, Nov 20, p111

British Speech Visualizer

Recent British patent described a device that will enable deaf people to read speech by means of two-dimensional pictures of sounds.

Speech waves from a telephone line are fed to a balanced modulator, together with a locally generated carrier. Sidebands are passed through a narrow-band filter to an amplifier-rectifier whose output varies the brightness of a cathode-ray tube.

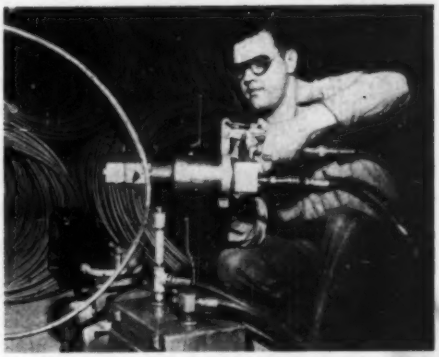
The carrier is swept through a range of frequencies so the incoming speech signal is scanned. Spot brightness on the tube varies in proportion to power component in each frequency band.

The tube is rotated to present fresh screen, while the beam deflection (at right angles to the screen travel) is locked to the frequency of the local oscillators. The persistence of the tube screen thus enables a two-dimensional pattern, corresponding to groups of syllables, to appear.—Electronics, Dec, p239

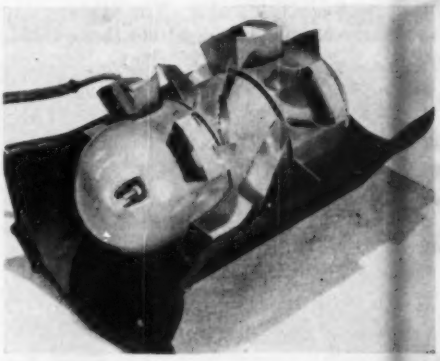
Remove Carbon with Rice

A speedy method of removing carbon deposits from combustion chambers without taking off the cylinder head has been developed by Oldsmobile Div., General Motor Corp. Rice, under air pressure, is introduced into the chamber through the spark-plug hole. The rice chips off the carbon deposits and thoroughly cleans all surfaces. About 4½ min. is all that is required for each chamber.—Am Auto, Dec, p69

This Month's How To . . .



. . . cut larger diameters of rod, bar shapes, chain, bolts, cable, similar materials is made easy with Manco Mfg. Co.'s new portable hydraulic unit. It consists of a small hydraulic pump connected by flexible hose to a 38-lb. cutting head. Hydraulic cylinder develops 10,000 psi. Power is supplied by either a portable gas engine or a 2-hp. electric motor. With pump operating, the operator closes the remote valve by hand, causing the cutter blade to make the cut. Valve release retracts the blade. Cutting cycle is 2½ sec. Unit is capable of cutting 1 7/16-in. rod.—Iron Age, Nov 23, p74



. . . supply fresh air to automobiles is answered by Hayes Industries, Inc.'s new design of its automotive heating and ventilating system. When automobile manufacturers went to "fresh-air ventilation," it was found that previously used squirrel-cage blowers offered too much resistance to air flow. But this axial flow blower has less internal restriction. Cost was brought down by developing stamped design in place of expensive castings with air-foil blades. Blades are attached with bent tabs, easily turned in a punch press. No welding is required.—Prod Eng, Dec, p103

. . . save on precast concrete building employs the tilt-up method for placing structural elements. Every element was cast on the floor slab, eliminating all but edge forms. Concrete bents were cast one on top of another by raising the side forms when the previous pour had set. Roof slabs were cast upside down and later up-ended, tilted, and set in place. The William T. Moran Co. developed a lifting and plumbing jig that hangs wall panels plumb during placement. Struts hold the units vertical while joints are being grouted or gunited.—Const Meth & Equip, Dec, p94

L-shaped Building Block Has Good Insulating Properties

The twin-walled dual-insulating building construction system is based on a building block having an L-shape. Two of these L-shape blocks form the standard wall unit. The outer and inner blocks forming the double wall have no direct horizontal contact with each other. "Motionless" or "dead air" is enclosed and sealed between these walls.

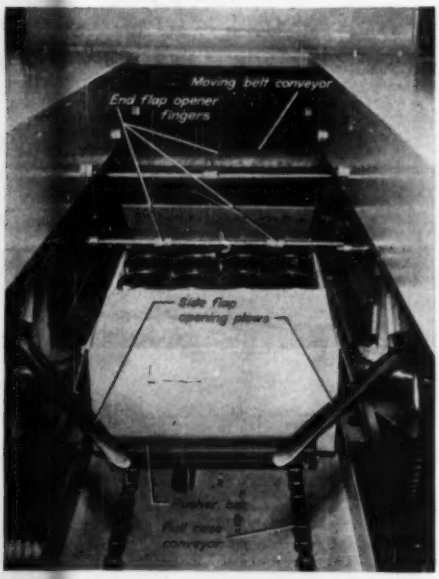
Since the vertical edges of the return ends of the blocks on the inner side of the walls remain open, cold air is permitted to settle without setting the air between the walls in motion. These open vertical joints, together with the motionless air, prevent formation of condensation between the walls. The system thus provides a dry healthy atmosphere within the building throughout the entire year.

Additional insulating properties in the wall are provided through the use of Pumicite block on the inner wall above ground level. A Pumicite wall is nailable. It can be left in its original form for interior finish with joints pointed, or it can be plastered direct to the block surface.

The twin-wall system, according to developer J. Fehr, Canada, is applicable to any climate for the construction of all types of buildings.—Am Builder, Dec, p136

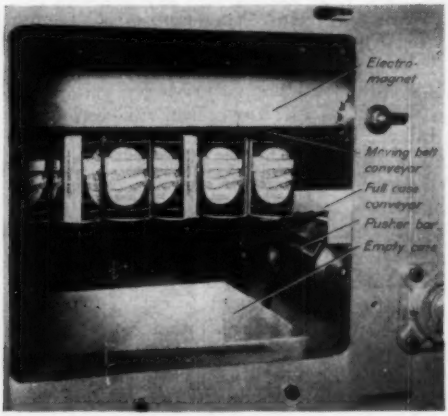
Assembly-Line Lettuce

Waste and shrinkage factors in leaf lettuce, normally as much as 30%, are being reduced to practically nothing by Ruetenik Gardens through the application of a progressive pre-packaging program.



FAST CAN UNLOADING

New can uncaser made by Bruce Engrg. Corp. feeds in full single-depth cases of empty tin cans on chain conveyor. Side flaps are opened by pressure on sides from rollers, then fingers raise end flaps. Case next passes under electromagnet that pulls cans from carton and holds them to underside of a moving conveyor belt. Case drops free, while cans are carried to second belt and out of machine. Capacity is 27 cases or 648 cans per min. Cases and cans travel in straight lines with no sharp turns to limit speed or generate shocks. Automatic interlocks and switches shut down the machine as soon as any trouble develops in the operation.—Prod Eng, Dec, p102



Main principle of the idea was to cut down the rate of moisture loss of the produce. Moisture-proof cellophane was found to be the best material for the job. It also provided excellent visibility for the lettuce, whose greatest selling point is its own fresh, green appearance.

The packaging machine is electrically driven and requires only three operators. Basically, the machine consists of a long funnel, through which paddles propel the lettuce in a cleaning process.

One operator trims the lettuce and places it in the opening of the funnel. The second operator positions the cellophane bags over the other end of the funnel, and the lettuce is automatically pushed into the waiting bags. A third operator packs the filled bags (unsealed) into shipping containers. The assembly line bags up to 35 stalks of leaf lettuce per min.—Mod Packaging, Oct, p111

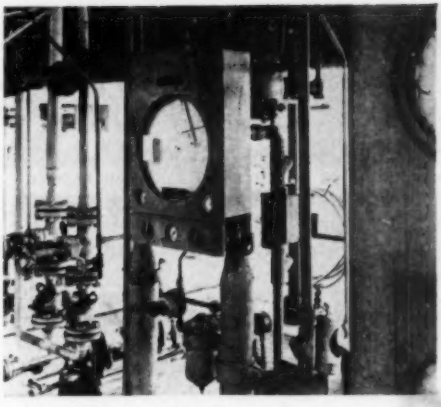
CO_2 Protects Substation

Low-pressure carbon dioxide systems provide low-cost fire protection for 30 automatic substations of Southern California Edison Co. At each substation, liquid CO_2 is stored in tanks of ½- to 12-ton capacity. Tanks are cork-lined and refrigerated to 0°F.

Control of system can be automatic or manual, or a combination. Automatic control with d-c. operation is used at automatic stations with a manually operated valve at an accessible outside location.

The equipment operates in a sequence determined by an electric timing motor driving a system of cam switches. Sequence is: (1) thermostats close contacts at 165°F., pick up motor relay, and start timing motor; (2) all fans are shut off automatically, and alarms are sounded; (3) the main solenoid valve in the discharge line opens to flood the area with CO_2 gas.

As pressure in the line increases, piston-type releases permit closing of all doors, windows, and other openings. In 80 sec., CO_2 concentration is 40-70%.—Elec World, Nov 6, p100



MEASURES CHEMICAL FLOW

At Shell Chemical Corp.'s Deer Park, Tex., plant, conventional flow meters with mercury U-tube could not be used as traces of mercury were intolerable. Answer was development by Minneapolis-Honeywell Regulator Co. of flow recorder-controller with a mercuryless differential pressure unit that has actuating element of liquid-filled bellows, torque tube, and pressure chamber. Orifice in flow line creates differential pressure across bellows; movement of bellows rod causes torque tube to actuate recorder pen.—Chem Eng, Dec, p109

Sound Waves Sweep Harbor

Supersonic sound waves are being used to locate under-water harbor obstacles in the Chicago area. This method requires less time and fewer men, assures greater accuracy, and provides an automatic record of the sweeping.

Three outboard oscillator units were used simultaneously in conjunction with a single recorder. The oscillator units were mounted abreast of each other on a catamaran. One unit was suspended between the two outriggers; the others hung from their outer sides.—Eng-News Rec, Dec 7, p54

1950 Survey of Power Trends

What is the general power-plant-design situation in the U. S. is often the question of overseas power engineers; here are answers

POWER-PLANT SURVEY made by *Power* magazine of more than 500 central-station and industrial steam units and 150 hydro-stations has yielded useful information to the power engineer on general design trends.

About 10,100,000 kw. of steam capacity, excluding municipal and co-operative stations, was scheduled to go into operation in 1950-51. One third of the units surveyed now use 800-psig., 900° F. steam; one-sixth use 1,200 psig., 950° F. About 46% use 1,200 psig. or a higher pressure. In terms of capacity, 27% use 800-psig., 900° F. steam; 21% use 1,200 psig., 950° F. About 61% use 1,200 psig. or a higher pressure.

Dominant in the turbogenerator field is the 60- to 69-mw. range, both in the number of units and in total megawatt capacity. In the boiler field, the 600,000-lb.-per-hr. range dominates in number of units and total capacity, thereby paralleling the turbine spread.

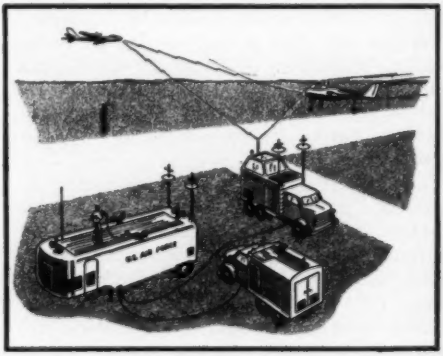
Higher steam conditions are leading to the use of a greater number of bleed points. The 1949 survey (McG-H Digest, Nov '49, p48) showed four bleed points to be most popular. Now for the first time, there are as many new installations with five bleed points as with four. Larger number of bleeds are also finding increasing use.

The greatest number of industrial boiler installations fall into the 299-psi.-or-below class, and are less than 30,000 lb. per hr. Almost three-quarters of the total number of boilers operate at pressures below 300 psi. More than half have capacities of less than 30,000 lb. per hr. But total output of boilers above that capacity is greater than that of smaller units.

The pressure range of 300-799 psi. represents about 25% of the boilers reported in the survey. Less than 2% operate at 800 psi. or more. The concentration in the lower and middle pressure ranges indicates that many industrial boilers are installed only to generate steam for process and heating. Where power is generated also, pressure levels are fixed by a reasonable balance between process and power demand.

Furthermore, industrial-plant designers tend to be conservative in pressure and temperature selection because most plants operate with relatively high percentages of makeup water. This makes water treatment complex and expensive. But in industries in which electrical load is high in relation to steam load, look for more high pressures and temperatures.

Fuel flexibility is getting more atten-



SAFER TEST FLYING

Television receivers in this remote flight-control system enable the pilot of the drone plane to see the horizon and instrument panel, even with the craft miles away, and thus control the drone as precisely as though he were at the controls. The drone is landing at the right. At right center is the control truck containing two TV receivers and a complete cockpit for controlling the drone. TV transmitters are located in the drone cockpit.—Aviation Wk, Nov 20, p44

tion. Spreader stokers, suitable for a wide range of coals, gain in popularity. A large number of units are designed for firing both oil and gas. Pulverized-coal units and fewer than in the past; most are in boilers of large output.

Water-power development in the U. S. and Canada reached its fastest growth in the last 2 years. In the U. S., nearly 2-million hp. went into service in 1949 and 1.6-million hp. in 1950. Total capacity is now 29.1-million hp.—nearly double that in 1930.

In Canada, installed capacity has been raised to 12½-million hp. Half of last year's increase was made at the Des Joachims 500,000-hp. plant on the Ottawa River. Biggest water-power event in Canada in 1950 was ratification of the treaty with the U. S. that makes possible the redevelopment of the Niagara River and use of the increased diversion.—Power, Dec, p83

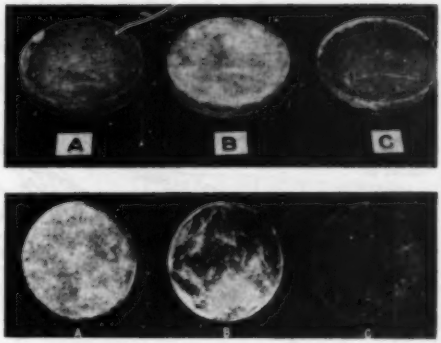
Magnesium-Zirconium Alloys

Metallurgical research at the U. S. Air Materiel Command has revealed improved ways to introduce zirconium into magnesium in making magnesium-zirconium alloys.

Use of a master alloy had to be discontinued because the cast bars were usually dirty. The spongy nature of the master alloy permitted it to absorb gases and foreign particles.

Of different methods tried, best results were obtained by adding zirconium salts. Equally successful were zirconium chloride and a mixture of 50% zirconium chloride, 25% sodium chloride and 25% potassium chloride.

The salt was thoroughly dried and charged with the magnesium so it would melt as the metal melted. If salts are not dried before alloying, there is no grain refinement and the amount of zirconium in solution is small. Cause is suspected to be hydrogen getting into the metal and reducing the solubility of the zirconium.—Foundry, Dec, p95



METHOD TESTS FILLED PLASTICS

Most testing methods of items molded from composition containing coarse pigments, fillers, or fibers are destructive, time-consuming and do not yield representative results. Radiographic testing solves this problem accurately and rapidly. Visual check (top) of specimen disks (A and B contain 25% glass fiber, C has 20%) indicate no differences between A and C; B shows minor non-uniformity. With radiographic test (bottom), such characteristics as B's nonhomogenity and higher fiber content of A as compared to C are clearly shown.—Mod Plastics, Nov, p123

Spindle Power Consumption

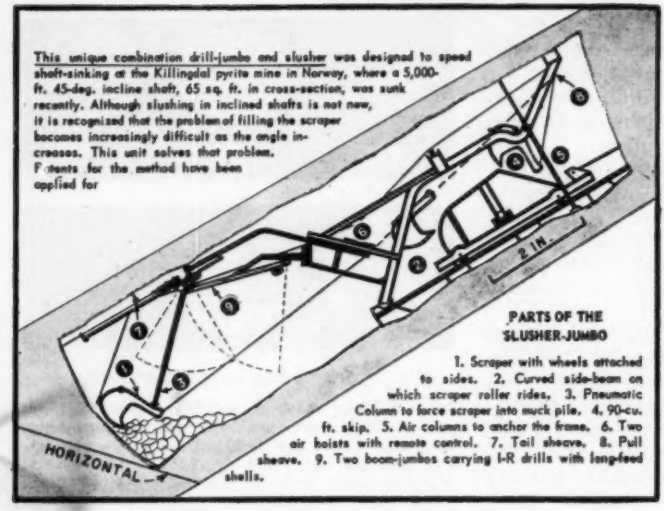
An individual spinning spindle requires comparatively little power; but in a cotton mill with thousands of spindles operating, spindle power consumption can become an important cost factor. A careful choice of spindle oil will help cut power requirements. Here are some oil characteristics to look for:

1. The oil must not be affected by oxidation.

2. The oil should be light in color, so that oil spots are easier to remove from yarn or goods.

3. The oil should be closely fractionated to resist atomizing and viscosity change in service.

Tests have indicated that the power requirement of the spindle increases as the oil gets heavier.—Textile World, Dec, p122


This unique combination drill-jumbo and slusher was designed to speed shaft-sinking at the Killingdal pyrite mine in Norway, where a 5,000-ft. 45-deg. incline shaft, 65 sq. ft. in cross-section, was sunk recently. Although slushing in inclined shafts is not new, it is recognized that the problem of filling the scraper becomes increasingly difficult as the angle increases. This unit solves that problem. Patents for the method have been applied for
2 IN.
HORIZONTAL
PARTS OF THE SLUSHER-JUMBO
1. Scraper with wheels attached to sides. 2. Curved side-beam on which scraper roller rides. 3. Pneumatic Column to force scraper into muck pile. 4. 90-cu. ft. skip. 5. Air columns to anchor the frame. 6. Two air hoists with remote control. 7. Tail sheave. 8. Pull sheave. 9. Two boom-jumbos carrying I-R drills with long-feed shells.

SLUSHER-JUMBO

This combination of drill jumbo and slusher has proved advantageous in mining inclined shafts. It provides a platform for two Ingersoll-Rand boom jumbos with long-feed shells. A pneumatic system aids in filling the scraper and holding the machine on the floor of the shaft.—Eng & Min J, Dec, p87

New Chemicals Developed for Difficult Applications

Lower costs, better end products are the objectives of most new commercial chemicals. Here are a few:

• Nearly every paper mill using rosin has had sizing problems, especially on hard-sized sheets. One solution is to adopt a more expensive modified rosin or equally expensive beater additives.

Another solution is offered by Monsanto Chemical Co. with its new Mersize CD-2—a synthetic resin designed especially for paper sizing. Resin is easy to use, is inexpensive, and imparts greater temporary wet strength and lesser degree of feathering as measured by the ink-flotation test.

• Durable wrinkle and shrink resistance to cotton and viscose rayon fabrics is promised by Zeset, a new material just developed by E. I. du Pont de Nemours & Co. It also gives both fabrics a soft, wool-like finish. The finish can be applied by any mill having efficient padding, drying, heat-treating and washing equipment used in applying thermosetting resins.

• Silicone-rubber parts can be made easier and with highly improved mechanical and thermal properties with a new silicone rubber compound announced by General Electric Co. Designated as 81223 compound, the silicone rubber should open up more applications, such as diaphragms, boots, sleeves, belting, and mountings.—Chem Eng, Dec, p160, 161, 162

Vacuum-Bags Sliced Bacon

Longer shelf less and less rancidity, discoloration, drying out and mold are achieved by Armour & Co. with its method of vacuum packaging of sliced bacon in heat-sealed, flexible bags. Made of laminated Pliofilm and cellophane, the bags retain at least 24 in. of the initial 29 in. of vacuum.

After bacon slices are bagged, the bag is inserted in a slot-like compartment of any one of five vacuum-sealing chambers of the sealing machine. Mechanical guides grip top and bottom

of the bag, a vacuum head descends to the chamber and draws 29-in. vacuum to collapse the bag, and then laps are sealed by heat.

Market testing began 2 years ago in several cities. Since then, seven plants have been equipped for vacuum packaging. Sliced luncheon meats also are being packaged this way.—Food Ind, Dec, p38

Electric Power for Wheels

The latest in prime-mover propulsion consists of a traveling power plant with power applied by electric motors built into the wheels.

A diesel engine drives one a-c. and one d-c. direct-connected generator. In each of the four wheels is a variable-speed d-c. motor. Each motor drives through a pinion, two reduction gears, and a ring gear. Braking is by motor control.

The rig steers at both ends; each pair of wheels is swivel-mounted. Steering control is by an a-c. motor on each axle powered by the a-c. generator. A heavy-duty winch is a-c. motor driven.

R. G. Le Tourneau, builders of the prime mover, claims the advantage of the machine lies in its ability to start, pull, and stop smoothly without jerking, and in its precision and positive control. —Const Meth & Equip, Dec, p88

Paper Lining Reduces Claims

New paper lining for box cars consists of two sheets of kraft paper cemented together with asphaltum, reinforced with rayon yarns, and creped after lamination.

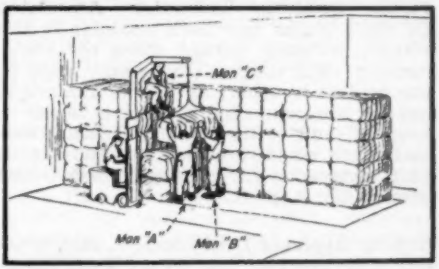
The paper serves these purposes in reducing damage:

1. It prevents slivers, nails, and other sharp protruding objects from tearing sacks, and it makes floors, sides, and ends grain tight.

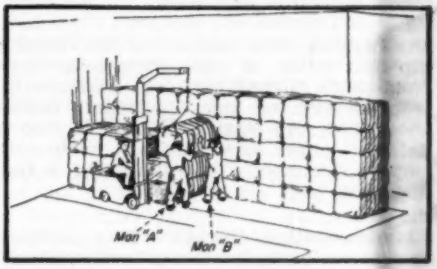
2. The paper offers protection against dirty and oily floors.

In addition, the paper is tough enough to allow lift-truck loading and unloading. —Railway Age, Nov 4, p55

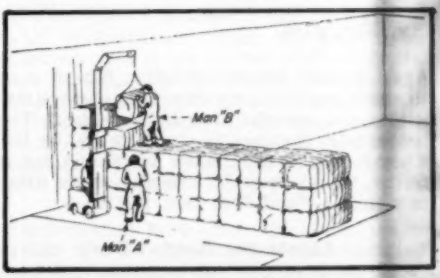
Method Stacks Cotton Bales With Less Labor, Cuts Costs



OLD METHOD required crew of four. Men A and B are idle while C positions bales in top layers. C is needed only during stacking of two top layers.



NEW METHOD—STEP ONE requires that men A and B work at floor level and assist, as before, in positioning bales in bottom three layers only. C is not needed.



NEW METHOD—STEP TWO begins when three-layer section has been completed. Man B works from top layer to stack last two layers.—Textile World, Dec, p151

Technical Shorts

Parks Outdoors—Tidewater Associated Oil Co.'s trucks now park outdoors in the winter, releasing garage space for warehousing. But engines start easily, even in the coldest weather, as 100-w. immersion heaters are connected to engine blocks to keep oil and water warm. Heating elements are wired to outlets on trucks with plug receptacles for extension cords.—Elec World, Dec 4, p146

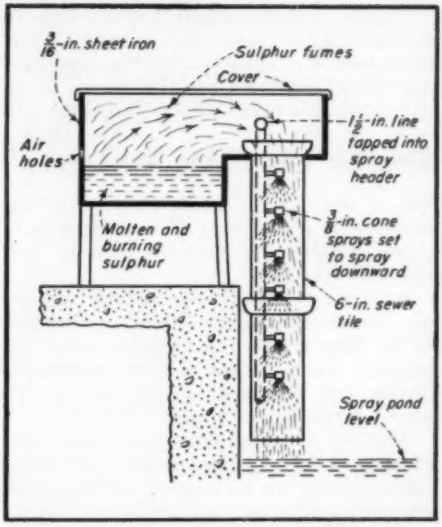
Tubing Replaces Drill Steel—A mid-western mine operator has tried 1¼-in. seamless electric steel tubing in place of drill steel. Footage drilled before breaking is reported to be 400 ft. compared with 112 ft. obtained with conventional drill steel. —Eng & Min J, Dec, p104

Dip Logging—New method for determining dip and strike of subsurface formations from single oil-well bore logs continuously from bottom of hole to deepest casing shoe. This dip-logging method is also a detailed caliper survey and an inclination survey. Accuracy is excellent.—Oil & Gas J, Oct 19, p151

Aluminum-alloy Growth—Two methods are successful for holding growth in aluminum-alloy dryers for core baking to a minimum. (1) Use an alloy containing 5-6% silicon. (2) Give castings a triple heat treatment of heating to 50-100° F. above highest baking temperature, cooling slowly, and repeating twice more—Foundry, Nov, p154

Ages Cheese Faster—Adding filbert nuts to cheese ages it in a few days the equivalent of 2-3 months of ordinary aging. The proteolytic enzymes in the nuts do the job. They also give the cheese the sharp, tangy flavor found only in cheeses made from raw milk.—Food Ind, Dec, pW102

Sulphite Liquor for Roads—Dusty unsurfaced roads can be made pleasant driving by treating them with sulphite waste liquor from paper mills. Flambeau Paper Co., Wis., finds it an easy way to dispose of its waste liquor.—Paper Ind, Oct, p723



HOW TO TREAT COOLING WATER

This sulphur burner will keep alkalinity down in open power-plant spray ponds. It uses a small amount of spray water to produce an aspirating effect, drawing air in over the sulphur pot and fumes down the tile conduit. Fumes are absorbed by water droplets. —Power, Dec, p126

Stacks Overhead—Stacker crane developed by Du Pont can tier pallet and skid loads in aisles only 18 in. wider than the load length—52% less than with fork truck. It has a rigid non-rotating mast supported from an overhead bridge and carrying the pickup carriage that handles the load.—Steel, Nov 20, p104

Hot-spray Lacquer—Applying lacquer to automobile bodies is speeded up by hot-spray process. Lacquer thickness per coat is increased to 2.2 mils over the 0.7 mil maximum with cold spraying. Two hot-spray coats are used where three were formerly required. Cost is lower, even though lacquer finish must still be polished.—Prod Eng, Dec, p151

Something for Gallstones—Ultrasonic energy has proved useful in breaking up gall stones inside dogs and rabbits. But this technique, announced by Yale University's School of Medicine, has not yet been tried on humans.—Electronics, Nov, p216

Carries Hot Cargo—Radioactive isotopes, used for research, are now being flown more economically. South African Airways packs isotope container in plane's wingtip. Container does not have to be shielded as with previous system of carrying isotope in cabin—Aviation Wk, Nov 27, p44

Smoking Glass Molds—Mold-smoking by acetylene blowpipe lubricates glass-bottle molds by coating surfaces with carbon. It facilitates glass flow, prevents glass from sticking to mold on cooling, brings mold up to correct operating temperature, and results in better bottles.—Ceramic Ind, Nov, p76

Radar-reflecting Buoys—Latest aid to navigation is a special buoy installed by the U. S. Coast Guard on the Great Lakes. Buoys have pyramid-shaped steel pockets designed to reflect radar signals from ships.—Marine Eng & Ship Rev, Dec, p83

MAN-MADE TORNADO

This is not an howitzer or the exhaust of some super jet engine. It is the end of the Arizona-San Francisco 34-in. natural-gas pipe line during purging. Line is cleaned out with gas pushed through at a mile a minute and with a force equal to that of a tornado.—Oil & Gas J, Nov 30, p47

Pour Curbs with Side-dump—By taking a standard end-dump unit on a truck, turning it sideways, and attaching a screw release on the tail gate, the North Carolina State Highway Dept. has solved the problem of pouring concrete curbs or highway widening strips. All manual handling and transportation are eliminated.—Const Meth & Equip, Dec, p53

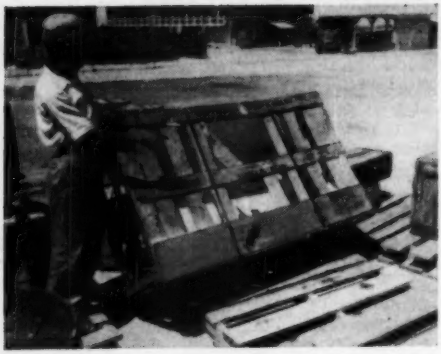
Arithmetric Shortcuts—To square a whole number plus ½, add ¼ to the product of the number by itself plus one. Thus, $2\frac{1}{2} \times 2\frac{1}{2} = 2 \times 3 + \frac{1}{4} = 6\frac{1}{4}$. To get the product of two consecutive numbers ending in ½, square the larger whole number and subtract ¼. Thus, $19\frac{1}{2} \times 20\frac{1}{2} = 20 \times 20 - \frac{1}{4} = 399\frac{3}{4}$.—Power, Dec, p122

More Machines, More Work—A recent study by the Michigan Tool Co. reveals that every year that the installation of industrial equipment increased there was an increase in employment. Every year in which there was a decrease of installation of equipment there was a decrease in employment.—Am Business, Nov, p5

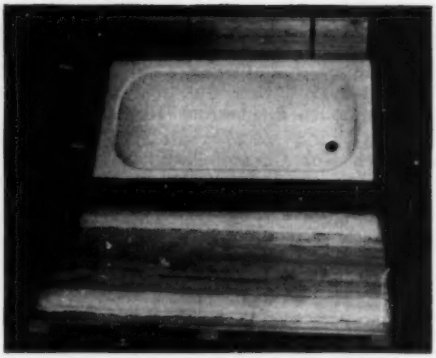
How About Coolants—At Chevrolet's Muncie plant, coolant for gear cutting is a hit-or-miss mixture of reclaimed oils with high percentages of lard and sulfurized oils plus even hydraulic and machine lube oils. It is the best coolant found so far. Looks as though some real research is needed on gear-cutting coolants.—Am Mach, Nov 27, p141

How to Save Plastic—In plastic molding, mold temperature must be just right; otherwise, parts are ruined while temperature is adjusted. To avoid this waste, a temperature controller was installed on every molding press at Remington Rand Inc.'s electric-shaver plant. Controller regulates steam flow to maintain correct mold temperature.—Oper Eng, Dec, p20

Concentrated Milk—Not condensed, evaporated or dehydrated, but concentrated milk has gone on the market recently in Delaware. Concentrate is available either frozen or liquid. Frozen concentrate process is similar to the one used for fruit juices.—Business Wk, Dec 2, p86



WRONG WAY to pack bathtubs for export is illustrated by this case of underpacking



RIGHT WAY shows closed box of seasoned wood with steel strapping and creped wadding

How Aramco Packs For Export

Arabian American Oil Co.'s experience in grueling 11,500-mile shipment of 158,000 items points the way to safe, efficient export packaging

A MIRACLE of solved logistics problems is necessary to move 40,000 tons of goods a month from the U. S. to Saudi Arabia with as little loss from damage or theft as possible.

Arabian American Oil Co. (McG-H Digest, July '50, p17) is the miracle worker. Aramco has poured much money and effort into the problem of developing its own packing operations for getting vast quantities of materials in good condition to its oil-field community.

No deep-water docks were available. Saudi stevedoring, at best, was primitive until it learned the technique of machine-unloading and trucking. Climatic variations of heat and cold exacted losses in materials stacked in the open on the beaches.

Though Saudi nationals became experts in materials handling, Aramco experience pointed significantly to the inadequacy of prevailing packaging; hence, the development of Aramco's own packaging specifications.

Portable Houses—For example, there was the handling of a shipment of 28 portable houses. Aramco cargo specialists devised a container that measured 18 ft. 9 in. long, 13 ft. 7 in. high, and 6 ft. wide. Nested within this box was every item needed for setting up the house.

The wall, ceiling and floor paneling of the houses was vertically positioned within the unit-load container in a manner to reduce free space to a minimum. Metal straps securely anchored the paneling to the floor members. Cushioning material between straps and wood prevented chafing of the panels. Two layers of 70-lb. Kraft paper separated panels from each other. Damage from shifting was prevented by blocking and bracing.

Throughout the job, sealers, moisture-resistant barriers, and corrosion preventatives were employed.* Small hardware—nuts, bolts, screws, and doorknobs—were packed in clear plastic tubes sealed with plastic caps.

Bathtubs—To get a white porcelain tub to the Persian Gulf in usable condition has become somewhat of an achievement. The vendor, at first, made no

attempt to pack the tubs any more protectively than if they were to be shipped 100 miles by train. The result was disastrous. In a shipment of 50 tubs, 40 were lost.

Aramco took the tubs and put them in closed boxes. Creped-wadding cushioning material was used where porcelain surfaces came into contact with wood. Crates were built of sound and well seasoned Douglas fir. Two steel straps were wrapped around the tub box for extra reinforcement.

Cracker Shipments — Crackers and cookies were touchy items to ship. Old-type containers could not take the beating or keep out heavy moisture condensation.

After several months study, Aramco specialists came up with two standard-size metal containers for the cracker goods. The metal boxes, with metal tops soldered on, were placed in rigid B-fluted fiberboard cartons. Then Aramco packed the cartons into a unit-load container. Built like a box car, the container has side sheeting of 1-in. pine. Beams, uprights, and diagonals are made of 2 x 4-in. Douglas fir. Skids are notched so the container can be handled by slings or fork trucks.

Additional Precautions — Cargo specialists devise packing specifications; if the vendor cannot meet them, he must send the goods to a packer determined by Aramco.

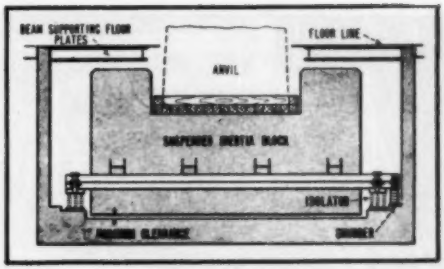
At all piers of the harbor cities from which Aramco consignments of goods leave for the Middle East, export packers or cargo inspectors check the shipments, sometimes requiring repacking. — Mod Packaging, Nov, p114

Long-Life Parachute Harness

Longer service life for parachute harnesses and greater safety in jumping operations are achieved by a process of treating the ribbon-like strands of nylon webbing with a polyvinyl-butyral resin. The U. S. Air Materiel Command devised the process of pressing the resin into the webbing.

Produced by Monsanto Chemical Co., the resin does not penetrate the nylon fibers but acts as an adhesive, keeping them from becoming separated.

Tests of the treated webbing indicate that it outlasts the untreated type by three times.—Mod Plastics, Nov, p165



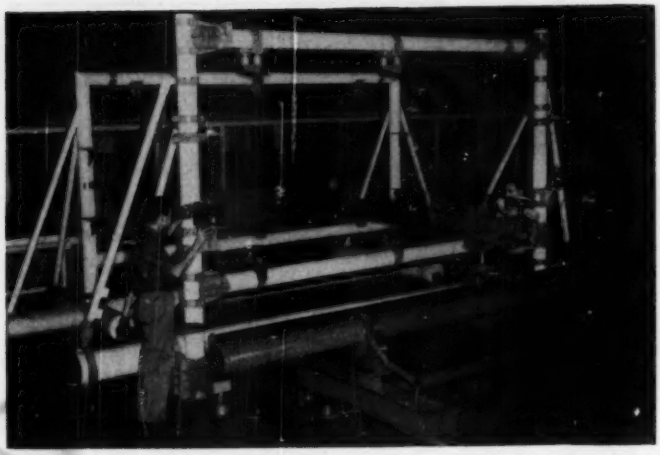
ISOLATES FORGING HAMMER

Vibration isolation of forging hammers has proved its value at Steel Improvement & Forge Co. by (1) eliminating cracking or spalling of foundation blocks, (2) reducing maintenance costs, (3) improving working conditions. The concrete foundation block is supported by springs under I-beams through the block. Snubbers limit vibration cycle.—Am Mach, Oct 16, p136

Measure Tension Continuously

Improved yarn quality and increased production can result from accurate measurements of spinning tension. Such factors as the size and condition of travelers, size and shape of yarn packages, and spindle speeds can be corrected if the spinning tension is known.

A General Electric Co. device will measure and chart spinning tension continuously. It consists of one or a group of thread guides mounted so that their positions are affected by yarn drag. Any change in position causes a change in the electrical balance in a bridge circuit. This electrical change is recorded on a chart in terms of the tension in the yarn. —Textile World, Dec, p153



OPTICAL TOOLING

Extreme accuracy is achieved with this method for quick erection of jigs and fixtures for aircraft structures. Republic Aviation Corp. developed the optical positioner, utilizing a light-beam baseline, which holds the jig fittings "in space" and permits accurate alignment in any attitude. Telescope and target reticle at fixture's opposite ends set up basic collimation line. Man at right adjusts illuminated target-carrying positioner.—Aviation Wk, Dec 11, p23

New Electrolytic Process Makes High-Purity Chromium

New process for making electrolytic chromium has been developed by the U. S. Bureau of Mines. It is now in pilot-plant operation. A new plant to employ the process is being built by Union Carbide & Carbon Corp.

The process is based on a simplified but improved electrolytic-cell design and a new electrolyte. The cell is assembled by starting with an anode compartment in one corner of the tank and alternately placing cathode frames and anode compartments until all frames are in place.

The anode compartment consists of a frame made from strips of Lucite or Plexiglas sheet with a Vinyon cloth diaphragm cemented to each side. Each compartment holds one anode of lead-silver sheet burned to a copper header bar. The cathode frame is made from Douglas fir strips joined with Monel screws.

The process employs ferrochrome, which is passed through leaching, clarifying, conditioning, crystallizing, and aging to obtain the chrome alum feed for the cell. The alum feed also may be prepared directly from the ore or from sodium dichromate.—Steel, Dec 4, p92

Product Design Shorts

Aircraft-weight reduction has led to the trial of aluminum conductors in the low-voltage electrical systems. Switching to aluminum would save nearly 100 lb.

A molybdenum coating on dissimilar metals and alloys may be useful where an object's surface is raised to high temperatures and must therefore resist corrosion. Plating would be done by reduction of molybdenum pentachloride vapor.

Steel and copper wire precoated with electrolytically deposited nickel can be cold-drawn, welded, bent, or twisted without loosening the coat. Result is smooth corrosion-resistant finish, regardless of shape or cross-section.

Oil-bath air cleaner for fractional horsepower motors has transparent plastic outer case. Level and condition of oil can be seen at a glance.

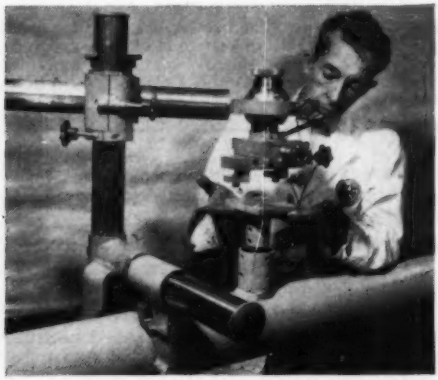
"Transparent" metal—silver chloride—may help study metal behavior. Its mechanical properties, elastic constants, compressibility, thermal expansion, and crystal structure are quite like those of

many metals so the clear compound can be used to study their internal behavior. —Prod Eng, Dec, p5

Spoils Cheese Flavor

Flavor of cheese can be ruined by the quaternary ammonium compounds used in cleaning dairy equipment if they are carried over into the milk supply. They inhibit the growth of aroma-producing bacteria and cause a flat taste. But proper rinsing of equipment with clean water can eliminate this hazard.

Without proper rinsing before operations begin, some compounds can be carried over. And only a little is needed to spoil the cheese. Two parts per million will prevent aroma bacteria from growing in either the milk or the citrated whey. Lactic-acid bacteria are only slightly affected by the compounds.—Food Ind, Dec, p49



LOCATES WORKING SURFACE

Universal locator establishes finished working surfaces on large aircraft fixtures at Glenn L. Martin Co. in 36% less time than formerly needed. Tool is clamped to fixture, and working surface is clamped to its setting face. Tool is adjusted to correct position as determined by transit. Shank on locator is then within cylindrical cup previously welded to approximate position. Cerroalloy is poured into cup to anchor locator.—Am Mach, Nov 27, p125

Construction Methods and Trends Around the World

Prefabrication speeds project—The Dutch are using a novel form of prefabrication for fast erection of a 200-unit housing project. Method calls for steel-frame construction, precast concrete walls, and a thin concrete roof covered with aluminum. The steel frame consists of spot-welded, sheet-metal columns, beams, and joists. Colored concrete slabs are attached to the outside of the frame and wood-fiber concrete slabs to the inside. Mineral-wool bats are placed between these wythes for insulation. Standardized components allow fast erection with minimum labor.—Eng-News Rec, Oct 26, p52

Spectacular scaffold featured on arch bridge—A fixed-end arch of cellular reinforced concrete has been built on novel reinforced-concrete and timber falsework high above a gorge near Crucero, Chile. Timber scaffolding to support the forms was erected on timber trusses spanning from the gorge walls to a 133-ft. high concrete construction tower at midstream. Sand-boxes allowed lowering of the falsework after each completed phase of construction to permit deflection of the finished portion. Thus the weight of each finished phase was taken off the forms before the next phase was poured. This permitted economy in falsework and also served to prestress the structure during construction.—Eng News-Rec, Nov 9, p53

Fixed dredge keeps port open—To keep open the port of Salinas Cruz, the Mexican Port Authority has built and placed in operation a dredge of radical design. It consists of six winch-controlled intake tubes of 18 in. dia., hooked to suction pumps. Theory is that the fixed dredge, built on concrete blocks at the north mouth of the harbor, will catch the sand that otherwise is carried into the harbor.—Eng News-Rec, Nov 16, p57

New for the Kitchen . . .

. . . is this circular fluorescent lighting fixture with a baked white enamel body and a polished aluminum reflector. Lamp is 12 in. in dia. Other suggested uses for this Sylvania Electric Products, Inc., unit is in bathrooms, sewing rooms, sun porches.—Elec Whols, Nov, p99

New for the Sun Bather . . .

. . . is this portable fluorescent sun lamp consisting of heavy metal base, reflector, and lamp. Unit can be used close up for short exposure sun-tanning periods or at a distance all day long for ultra-violet ray benefits. Maker is Leader Electric Co.—Elec Whols, Nov, p97

Electronic Brain Controls New Aircraft Jet Engine

The latest General Electric Co. jet engine features an integrated electronic-fuel and jet-nozzle control system. This consists of a single lever for engine control; sensors for translating temperature, speed, and related data into electrical readings; and two electronic computers located forward of the engine.

Computers compare power needs, as indicated by the throttle, against the engine's performance, and correct any deviations between the two conditions by changing the fuel valve settings to control engine speeds or adjusting the variable-area tailpipe nozzle to control exhaust velocity or temperature.

Here are the advantages claimed for the electronic control:

- Influence of the human element and consequent errors are minimized.
- At takeoff, the pilot sets his throttle and the computer takes over. He does not have to watch temperature gages.
- Engine life will be increased because excessive temperatures or fuel flows are prevented.
- Maximum performance is assured. The sensors pick up slight changes in temperature, altitude, etc., and fuel flow is adjusted to cope with the new conditions.
- Control of the engine and afterburner is integrated. Fuel and nozzle adjustments are made with a high efficiency that is not obtainable by the pilot.—Aviation Wk, Dec 4, p21

Welding Convention Notebook

Aluminum can be inert-arc-welded with dc., slag can be controlled in pipe welding, and even more ideas are here for your welding department

THE 31ST ANNUAL MEETING of the American Welding Society, held in Chicago in October, featured first-rate technical sessions. The 24 sessions covered practically the whole field of welding: resistance welding, surfacing, flame hardening, weldability, welding design, pipe fabrication, automatic welding, welding of nonferrous metals, inert-arc welding, cutting, and others.

To help you improve your welding practice, the highlights of technical sessions are given here briefly. These ideas can readily be adapted to a wide variety of industries where welding is an important technique.

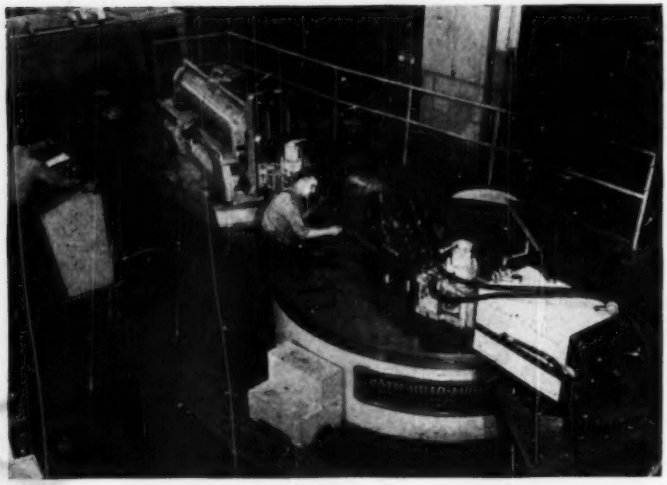
Surfacing: One paper discussed the characteristics of weld deposits from composite rods, which were made by enclosing granules of tungsten carbide in a mild-steel tube. The sheath tubing melts during welding and dissolves a part of both tungsten and carbon to form a hard matrix that anchors the hard granules in place. Surface roughness of abraded deposits depends on granule size and welding procedure. Abrasion resistance depends on the volume of undissolved carbides.

FLAME HARDENING: Described was a new flame-hardening machine that employs a radiation pyrometer to control the heating value precisely. A Rayotube, located above the work to be spun on this Cincinnati Milling Machine Co. unit, picks up radiant energy. When the black needle on the pyrometer, indicating work temperature, reaches the preset temperature value, the flames go off and the work drops into the quench tank.

Pipe welding: Slag entrapment in welding high-pressure, high-temperature alloy pipe can be troublesome. Most of the slag collects in undercuts on the side walls. Solution is a washed-weld technique instead of a series of beads. Preheating to 700–900° F. and welding under that preheat help prevent entrapment.

SUBMERGED-ARC WELDING: Automatic welding with two electrodes connected electrically in series while the work is insulated results in a fan-like arc. The arc makes a wide, thin weld deposit. There is little weld-metal dilution—from 1.5 to 10%. Uses are to put stainless on mild steel or pure copper over a steel plate. With copper, the base metal is preheated so that the copper layer will adhere. Process was developed by Union Carbide & Carbon Corp.

Welding aluminum: Experts have long said that aluminum could not be welded by dc. in the inert-arc process. But it can. The secret is to use extra-pure helium (99.9% pure) instead of argon shielding gas. It also helps to hold the filler rod at an extremely low angle, to move it away from the arc so the filler metal melts in advance of the arc, and to use a thoriated tungsten electrode.—Weld Eng, Dec, p17



BENDS ALUMINUM

Aluminum and magnesium aircraft parts at Boeing Aircraft Co. are bent on this 50-ton Bath contour former. Largest machine of its kind ever built, it bends parts to shape around rotating form blocks. — Am Mach, Dec 11, p180

Aerial Cable on Bridge Eliminates Outages

Unique 13.8-kv aerial cable has been installed on a river bridge by the South Carolina Electric & Gas Co. It has given no trouble after a year's service, whereas an overhead 13.8-kv. service line on wood crossarms with steel poles strapped to the same bridge usually has each year five or six tripouts from lightning surges and two or three conductor failures from lightning.

The cable is a single-conductor 4/0 Awg stranded alloy coated copper conductor, rubber insulated, shielded with conducting rubber tape and copper wires wound concentrically and embedded in the tape, and with rubber sheath, 15,000 volts for grounded neutral service. It is held to the bridge's steel work with clamps and brackets.

Clamps are about 100 ft. apart on the straight parts of the bridge and 50 ft. apart on the curved middle section. Messenger is $\frac{3}{8}$-in. high-strength Copperweld attached to the steel brackets. It was pulled to a predetermined tension, using a dynamometer, and then permanently clamped.

Three conductors are pulled one at a time and then attached to the messenger with cable rings about 18 in. apart. To prevent cables from creeping, they are tied in on each side of all brackets with marlin.—Elec World, Dec 4, p102

Optical Marking Method

The Goeta shipyards in Gothenburg, Sweden, are reported to have perfected a optical method of marking steel plate and ribs (for cutting) to a point where it can be used for large ships. The method has been employed at two German yards for building 1,500-ton vessels, while the Goeta yards are now using it for 16,000-ton vessels.

The method is not complex. Blueprints are photographed on a scale of 1:5 or 1:19, and the negatives are projected from above the work, throwing on it a full-size picture.

Results claimed are greater accuracy, better use of material, and less time and labor needed than with conventional layout methods.—Mach, Dec 2, p1754

Electric Governor Expected to Give Precise Speeds

An electric governor, being developed at the U. S. Naval Engrg. Experiment Station, is expected to give faster, more constant speed control of small generating plants.

It consists basically of three actuating elements, a frequency detector circuit that can be set for the desired speed, a damping circuit that stabilizes the operation, and a load responsive circuit that is actuated by changes in generator current. Resultant output of these circuits is amplified and fed into a servo motor that controls the throttle.

Main advantage of the generator will be its inherently fast response to load change. For example, if an electric governor were installed on a portable generator that supplied power for communications and other equipment, communications would not be interrupted if another piece of equipment were put on the line. The governor would immediately respond to the extra load and open the engine throttle before the speed could lag.

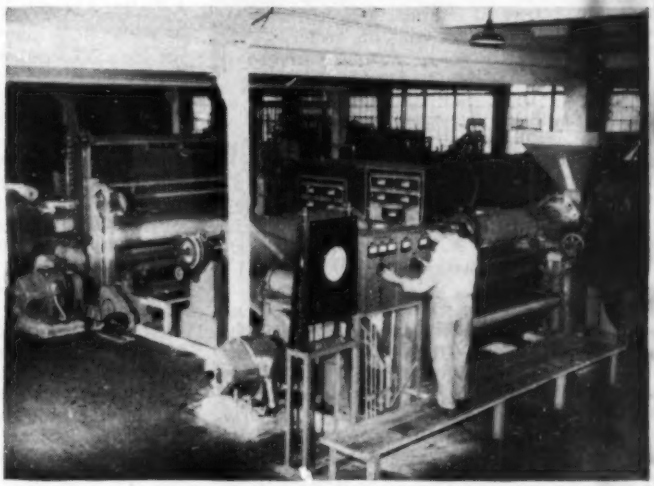
Under the same circumstances, the response of a conventional mechanical governor would be slower, causing possible interference with communications. —Prod Eng, Dec, p152

New Cotton-Bug Killer

New insecticide—called heptachlor by its manufacturer, Velsicol Corp.—is now going into volume production. It appears to have a multiple effect on insects, acting as a stomach poison, contact insecticide, and fumigant.

Preliminary findings of an experimental project underway show these results: dosage of 0.1 lb. actual heptachlor per acre—in the form of spray or dust—exterminated grasshoppers. As little as 4 oz. per acre proved successful in controlling the cotton boll weevil, thrips, and other plant bugs attacking the cotton plant.

Heptachlor will be sold to compounders with recommendations for the manufacture of 25% emulsifiable; 50% wettable powder; 1% base oil spray; and 5:5 cotton dust (5% heptachlor and 5% DDT). —Chem Ind, Nov, p722



PLASTIC COATER

Polyethylene coating machine at the Carthage mill of St. Regis Paper Co. coats kraft paper over a wide range of commercial thicknesses—from ½-7 mils. Most coatings are 1½ mils which equals 20 lb. of polyethylene per ream of 24x36-in. paper. Stock moves through rolls at front of machine to receive plastic, then is carried to rear for rewinding and slitting. — Paper Ind, Nov, p840

New Products

Emergency Generator — Designed for tractor belt-drive, new generator is available in capacities of 3,000, 5,000, and 10,000 w. Control box contains a-c. voltmeter so generator speed can be adjusted to correct voltage. Circuit breaker guards against overloads.—**D. W. Onan & Sons, Inc.**—Elec Whols, Dec, p92

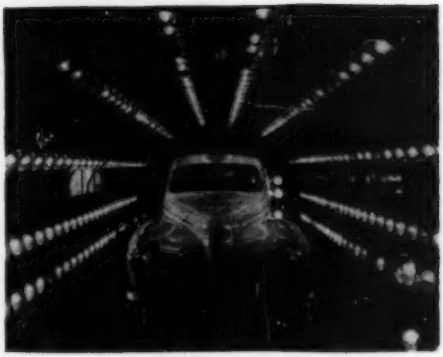
Tests Moisture Content—Foundry sands can be tested for moisture by balancing a sand sample in a tray, drying it with a heat bulb, then balancing it again. A dial shows the percent moisture in the sand originally.—**Claud S. Gordon Co.**—Business Wk, Nov 25, p67

X-ray Protection — Lead-glass garments for X-ray technicians, inspectors, doctors, and dentists protect arms, shoulders, and lower legs. The cloth is lighter than the heavy lead-rubber aprons commonly used. —**Bar-Ray Products, Inc.**—Weld Eng, Nov, p46

Contour Shaper — Duplicator attachment permits automatically shaping contours on dies, cams, and similar parts. Steel support post, fastened to the table, has on bottom end a roller that follows master form attached to shaper bed. Table and work follow movements of roller as it travels over master form.—**Cincinnati Shaper Co.**—Am Mach, Dec 11, p189

Starts Stubborn Screws—Device translates the impact from a hammer's blow into torque. It is useful for starting stubborn nuts, bolts, or screws, and for working in hard to get at places. It is available with different combinations of alloy steel bits and sockets.—**H. K. Porter, Inc.**—Hardware Age, Nov 2, p92

Mechanical Dump Hoist—Capacities of new dump-truck hoist range from light and medium-duty units to a model designed for trucks having a gross vehicle weight of 28,000 lb. Power is obtained from the truck's take-off. It features positive power-down and power-up action. Hoist is self-locking.—**Detroit Mechanical Hoist Corp.**—Eng-News Rec, Dec 14, p105



INFRARED OVEN BUILDS BUSINESS

This infrared baking oven at Bagby Hall Motors, Inc., in Jackson, Miss., has cut baking time to 20 min. on enamel repaint jobs and made them better looking, longer lasting. Within 60 days after installation, painting volume jumped 98%. The 14x30-ft. oven has 320 250-w. lamps arranged in 10 rows. Baking temperature is 175-190° F.—Elec World, Nov 20, p146

Mercury Battery—Type RM-1C mercury A battery is suitable for miniature radios, hearing aids, meters, instruments, penlights. Service life at 250-ma. current drain is 10 hr., depending on required minimum voltage.—**P. R. Mallory & Co., Inc.**—Electronics, Nov, p250

Teflon-impregnated Packing — Palmetto 1330 is a braided packing made from blue asbestos yarn impregnated with Teflon. It is resistant to acids, alkalies, corrosive chemicals, and solvents from −150 to +550° F. Sizes are ⅛ in. square and larger. —**Greene, Tweed & Co.**—Chem Eng, Nov, p176

Absorbs Pipe Noise—Soundzorber is rubber pipe with standard flanges embedded in each end. Installed in liquid, air or gas piping systems, it reduces noise and vibration. Sizes are ½-14 in., working pressures to 250 psi., and temperatures to 250° F.—**Finn & Co.**—Oper Eng, Nov, p68

Measures Bobbin Unbalance — Dynamic-balance indicator permits bobbin-unbalance measurements to be made accurately, quickly, cheaply. It consists of two spindles driven alternately at normal spindle speeds, plus an electronic system to measure unbalance.—**Universal Winding Co.**—Textile World, Nov, p176

Tail-gate Loader—Pick-up trucks and light-duty trucks can now have a manually operated tail-gate loader. It can lift loads up to 650 lbs. from ground to truck level in less than a minute.—**Stratton Equipment Co.**—Am Auto, Dec, p68

Polythylene Bottles—Unbreakable polyethylene bottles supply cooking departments of food plants with controlled amounts of flavors and colors. Different colored caps classify contents.—**Plax Corp.**—Food Ind, Dec, p118

Speeds Order Assembly—Versatile dolly racks can be pushed or towed and stacked. Post extensions, extension frames, and removable side bars increase the number of jobs the dolly can handle.—**Equipment Mfg. Inc.**—Factory, Dec, p134

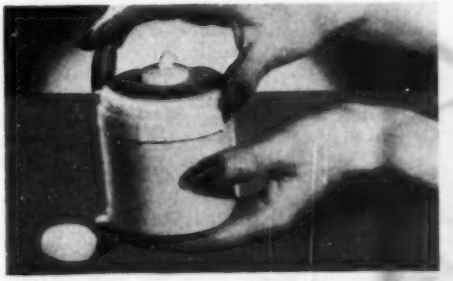
"Zips" up Plane Flaps—A zipper secures the fabric flap that seals off the space between control surface and structural member. The zipper quickly makes a seal that previously required the removal, then replacement of a long row of screws.—**B. F. Goodrich Co.**—Aviation Wk, Oct 30, p41

Screens Ceramics—Univibe vibratory riddle is adaptable to light screening requirements and laboratory work in ceramic plants. It handles dry, damp, wet or sticky materials. Weight is only 39 lb. It works on 110 v., 60 c. ac.—**Universal Vibrating Screen Co.**—Ceramic Ind, Dec, p110

Coupling More Flexible—A dihedral angle (one formed by two intersecting planes) is incorporated in the tooth shape of a new spline or gear-type flexible coupling. Result is that angular and offset misalignment between shafts up to 7° can be handled and bearing area is never less than one-half the tooth. Sizes are 1⅝-5 in. in bore—**Ajax Flexible Coupling Co., Inc.**—Prod Eng, Dec, p170

Convertible Pumps—Small pumps can be quickly and easily converted from shallow-well to deep-well operation. Shallow-well capacity is 480-990 gph. Deep-well capacity is 200-870 gph.—**Delco Appliance Div., General Motors Corp.**—Am Builder, Dec, p164

No-stretch Belt—Flat leather belt is reinforced with synthetic cords placed between plys to provide added resiliency needed to prevent leather from stretching beyond a certain point and then to return it to true length when load is released. Belt is available up to 24 in. wide.—**S. R. Sikes Co.**—Paper Ind, Nov, p909



BEAUTY JAR USES ITS HEAD

A new variation of the twist-container idea is being employed for Beautyrest Skin Creme, a cosmetic product. The dispensing feature is incorporated in the plastic closure. Twist the top of the jar and up comes cream; reverse the twist and it goes back. The closure dispenses only the amount of cream needed, and there is no cover to take off or put on. Refills are available, or the dispenser top can be transferred to other jars.—Mod Packaging, Nov, p93

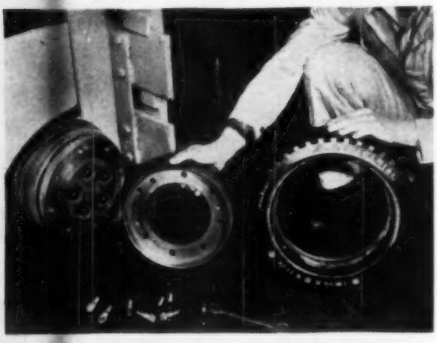
New Products (Cont.)

Saws Concrete — Asphalt or concrete streets, runways, floors can be cut at 5-12 fpm. with portable saws. Maximum depth of cut is 6½ in. Saws have electric motors or gasoline engines of 7½ or 13 hp.—**Clipper Mfg. Co.**—Elec World, Nov 13, p29

Prevents Freeze-up—Compact diesel-fuel-burning hot-water heater can prevent over-night standby freeze-up of diesel locomotive engines. It can also be used as a booster heater on self-propelled diesel rail cars. Output is 150,000 Btu. on 1½ gal. of fuel.—**Vapor Heating Corp.**—Railway Age, Dec 2, p70

Small Injection Molder—Fast injection molding of small plastic pieces is possible with the ¾-oz. machine. It is suitable for die tryout work and for molding dentures in dental laboratories.—**Moslo Machinery Co.**—Mod Plastics, Dec, p118

Packaged Power—Unit to transmit load at reduced speed consists of helical gear drive flexibly coupled to separate motor. Base plate under motor provides adjustment for shaft alignment. Unit sizes are 1-75 hp. with output speed of 6-280 rpm.—**Link-Belt Co.**—Prod Eng, Dec, p184



FAST TIRE CHANGE

Some models of Clark Equipment Co.'s industrial fork trucks are now equipped with demountable cushion-style rubber tires that can be changed in 15 min. Old-style cushion tires required several hours for removing and replacing.—Chem Eng, Dec, p146

Solders Aluminum—Soldering iron consists of a copper bit and a magnetostriction transducer that produces minute supersonic vibrations. These vibrations break up the oxide films that formerly prevented solder from adhering.—**Mullard Electronic Products, Ltd.**—Aviation Wk, Dec 11, p40

Controls Surface Carbon—Microcarb control can regulate carbon potential of heat-treating furnace atmosphere directly in terms of percent carbon for carburizing or carbon restoration. The control adjusts the flow of carburizing fluid according to the carbon potential sensed by the detecting element.—**Leeds & Northrup Co.**—Iron Age, Nov 30, p35

Electric Pressure Cooker—Unit consists of electric stove with high and low brown indicator on cooking dial, 60-min. timer, and 4-qt. saucepan. Unit automatically exhausts air inside cooker, reduces heat when right pressure is reached, cuts off electricity at end of cooking period, and vents itself slowly.—**Proctor Electric Co.**—Elec Merch, Dec, p105

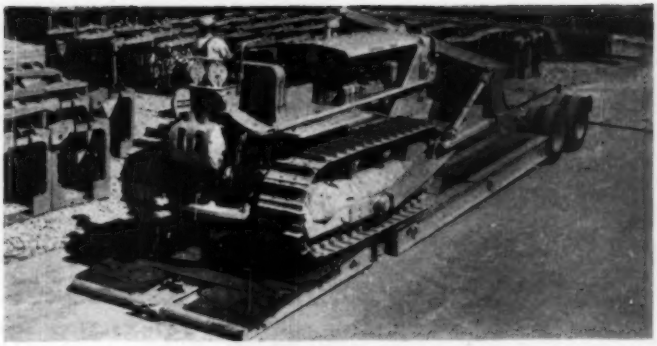
Hydraulic Power Digger — Lightweight power digger has a below-ground-surface reach of 8 ft. and a 10-ft. digging reach behind the tractor. Swinging arc is 140°. Standard shovel cuts an 18-in. trench. Capacity of bucket is 3.5 ft. Bucket lift permits loading dump trucks.—**Sherman Product, Inc.**—Const Meth & Equip, Dec, p107

Bakes Sand Cores—Electronic core oven has a 72-in. dia. turntable, with adjustable speed up to 6 fpm., that can handle 350 lb. of sand cores per hr. Unit can bake cores up to 15 in. wide, 28 in. long, and maximum combined height of core and core plate of 8 in.—**Induction Heating Corp.**—Foundry, Dec, p216

Ultrasonics Remove Scale — Limestone scale in boilers, water heaters, air-conditioning systems, and similar devices can be removed and prevented by ultrasonic waves generated by Crustex unit. Frequency is 27,000 c. Impulses are generated by condenser discharge causing magnetostrictive material to oscillate.—**Velan Engr. Co.**—Power, Dec, p150

FOLDING TRAILER

No ramps are required for this folding goose-neck trailer made by Martin Machine Co. When lowered, one man can load it with heavy equipment. Low platform height makes possible greater clearance for bridges and wires. — Fleet Owner, Dec, p66



Space-heating Mat — Dura-Thermal mat combines 16x27-in. wire-coil doormat with 280-w., 120-v. electric element. Unit is enclosed in heavy frame with protective aluminum rails.—**W. B. Snook Enterprise** —Oper Eng, Dec, p68

Scale Moves along Line—Automatic lap scale moves along track in front of pickers and is controlled by a pushbutton station. Scale prints lap weight on a tape. It is possible to check number of off-weight and on-weight laps.—**Toledo Scale Co.**—Textile World, Dec, p166

Versatile Instrument—Single, compact instrument will measure air velocity, air temperatures, and static pressure. The meter consists of a sensing element (probe) and an indicator.—**Anemostat Corporation of America**—Eng & Min J. Dec, p126

Fluorescent "Bulb"—Lite-Nite bulb screws into ordinary lamp socket and gives 500 ft.-c. at 3-5 in. Bulb is a 2x6-in. metal shade containing two 4-w. fluorescent lamps. Shade can rotate 300° for focusing. Ratings are 115v., 60c.; 220 v., 50 or 60 c.; and 110 v. dc.—**Stocker and Yale**—Elec World, Nov 20, p156

Shows Hottest Cylinder — Temperature maximizing indicator automatically picks the hottest of any six preselected cylinders of an airplane engine and indicates its temperature only. Thus only one indicator is necessary on the instrument panel. —**Lear, Inc.**—Aviation Wk, Nov 27, p36

Cleans Motor-generators—Cleaning system combines blowing and vacuum cleaning. Machine being cleaned is enclosed in heavy cotton cover coated with neoprene. Cover has 15 zippered slits through which cleaner hoses are inserted. Blowing dislodges dirt, and vacuum removes it.—**Lehara Sales Corp.**—Power, Nov, p148

Protects Wood Surfaces—Plastic coating, tradenamed Aroflint, is hard, flexible, and chemical resistant. It contains no drying oils or nitrocellulose, but cures through action of catalyst stirred into product prior to use. Suggested uses: floors, furniture, sporting goods, industrial equipment, ship woodwork.—**U. S. Industrial Chemicals, Inc.**—Chem Ind, Nov, p743

Wrapping Machine for Bakeries—Wrapper operates at speeds up to 65 packages per min. Features include: ball and roller bearings throughout; variable speed adjustment to prevent loaf crushing; accurate temperature setting; heated swinging tuckers to prevent wax accumulation.—**American Machine & Foundry Co.**—Mod Packaging, Nov, p134

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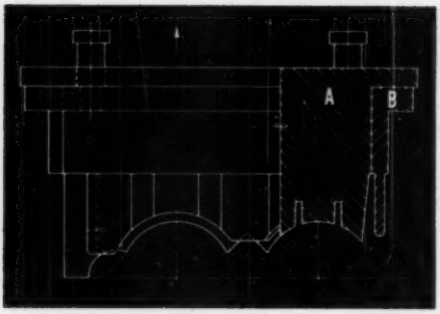
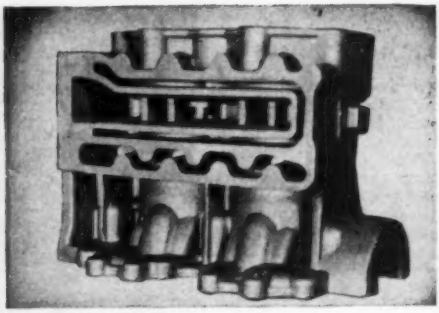


EXHAUST CORE A and water-jacket core B are withdrawn from mold as a unit



TWIN-CYLINDER water-cooled engine block is made by permanent-mold casting

How to Make Intricate Molds

Casting aluminum engine blocks is a rapid production method but requires care and knowledge to make the permanent mold

PERMANENT MOLD CASTING of aluminum engine blocks is no easy job to master. Molds are intricate, precise, and hard to make successfully.

The first step in making the mold at the Progress Pattern & Foundry Co. was (1) to analyze requirements of the engine block, (2) to determine what dimensional factors were to be maintained, and (3) to determine what metal sections were required.

A model of the designed mold was made to check its workability and the mechanisms for withdrawing the cores, as well as their possible effect on the thermal balance of the mold. A plaster casting was then poured to determine:

- Whether mold sections were too light or too heavy for successful casting.
- Whether mold partings were correct.
- Whether actuating mechanisms of the core draws worked properly.
- Whether metal thickness of the mold itself provided proper thermal conductivity to keep the mold at the desired temperature at all times during the casting cycle.

After minor design changes indicated by the trial casting, the wood pattern was developed for the permanent mold. Care was taken to make allowances for shrinkage of the iron from which the mold was cast and for finish on all joints and cores that could be machined readily.

Another important feature was to make sure that the back or gate, end of the mold would be l[illegible] to maintain proper metal t[illegible]. As this area is the hottest part of the mold with all the molten metal passing over it, the heat must be dissipated faster than in other parts of the mold.

After the mold was cast, the iron was annealed to 240-265 Brinell hardness. Then the joint of the cavity and the cavity itself were machined, and all integral cores applied to the mold. (Integral cores are those that do not need to be extracted in operation.)

Cores of the exhaust and water jacket were machined separately. They were so made that the exhaust core *A* could be withdrawn about ½ in., at which point shoulder bolts contact the water-jacket core *B*. Both are then withdrawn as one unit.

In making permanent molds, the company adapts a rack and gear for with-

drawing cores. This method draws cores in a straight line without binding. Small cores can be withdrawn a short distance by toggle levers.

When the mold was completely assembled, it was mounted on a mockup pouring machine. Mold mechanisms were operated to check and adjust tolerances to allow for free movement of the cores.

The mold was heated to 400° F. and sprayed with a special preparation of graphite, water glass, and water. Then it was heated to 750° F. before the first casting was poured.

The casting machine now being used is a box-type holding furnace suspended on trunnions. Tilting of the machine and its return at the end of each pour are controlled hydraulically. With the proper die temperature, spray procedure, and casting cycle established by trial, casting after casting can be poured rapidly.—Foundry, Dec, p84

Fan Stoppage Gives Warning

An unscheduled stopping of the main ventilating fan at the Colorado Fuel & Iron Corp. mine sounds a warning bell and lights a red lamp in the main shop, 3½ mi. away. Apparatus of the alarm system consists of:

- An open pipe between the intake and return.
- A hinged flap closed over the end of the pipe by fan suction as long as fan is operating.
- A spring strong enough to open the flap when the difference in air pressure between the intake and return is reduced.
- A mercury switch actuated by the hinged flap. When the flap opens because of fan failure, the switch closes the alarm circuit.
- The necessary wiring.

The pipe and switch are placed in a position where normal mine activities will not affect air currents on either side of the flap. The switch operates only on a drop in ventilating pressure caused by a fan stoppage.—Coal Age, Nov, p106

Yard Locomotive Rolls . . .

On Rubber Road Wheels . . .

. . . when it travels from one track to another. To get on tracks, driver positions locomotive across rails, retracts rubber wheels and lowers railway wheels onto track.

Or on Steel Railway Wheels . . .

. . . when shuttling rail cars. Whiting Corp., maker of the locomotive, claims it has 7,350-lb. drawbar pull. A gasoline engine provides power.—Business Wk, Nov 25, p65

Camera in the Foundry Does Many Jobs Cheaply

The still camera can be a most useful, yet inexpensive, tool in the foundry. Here are a few examples of its use:

• Plomb Tool Co. takes inventory by camera. Steel bars in the stockroom are no longer counted. Instead they are photographed. From enlarged prints, stock clerks count the number of bars and post inventory sheets. Preliminary lining up of stock in the racks and measuring odd lengths are done in advance at the convenience of stockroom personnel.

• An explosion caused by a leaky valve demolished the core room at one of American Brake Shoe Co.'s plants. Photographs were taken from all possible angles, and prints were forwarded to every foundry in the company. After maintenance workers saw the prints, a gratifying number of leaky valves were repaired.

• One large foundry in the U. S. follows a standard practice of recording photographically every step in building special apparatus. Subsequent duplication or replacement is greatly simplified. —Foundry, Nov, p108

Cold Drawing of Pinions

Small pinions can be made by cutting the teeth, extruding to the finished diameters and tooth forms, or cold-drawing rods into finished pinion rod.

Advantages of the last method include:

1. Cold-drawn pinions are cheapest for large-quantity production.
2. They are strongest and most wear resistant.
3. Structure is uniform because only a good material can be drawn.
4. Size and shape are uniform because cold drawing is a continuous process.
5. Inspection costs are low because one coil of stock represents a large quantity of finished parts.
6. The process is adaptable to all kinds of toothed wheels—ratchets, sectors, cam-shaped gears, and various types of non-circular gears.
7. Tool write-off is low. Tooling cost is generally much lower than that for tools used in gear-generating equipment. —Prod Eng, Dec, p114

Hawaii Scraps Big Guns

Scrapping of big guns in Hawaii has meant cutting thicknesses af laminated steel up to 30 in. and armor plate to 8 in. A heavy-duty water-cooled cutting torch with a No. 28 tip was found adequate.

This tip has eight preheat orifices of 0.070-in. dia. and a cutting orifice of 0.281-in. dia. Manifolds of ten oxygen and three acetylene cylinders were used with pressures of 85 psi. and 15 psi., respectively.

Torches were operated both manually and by machine. Proper counter-balancing allowed the use of the heavy torch on a lightweight, motor-driven, portable cutting machine.—Weld Eng, Nov, p20

New Steel Mill for Chile

American steel mills are equipped with high-tonnage units with maximum mechanization. But in many smaller countries, such mills are not economically feasible.

So for the Acero del Pacifico steel plant near Concepcion, Chile, a new finishing mill has been developed by Birdsboro Steel Foundry & Machine Co. It can handle a variety of products that would normally be produced on three specialty mills.

The mill is based on the so-called Belgian mill. The usual five or seven passes has been reduced to three or five. Thus, one set of rolls can carry passes for a wider variety of products and production of the rougher can be greatly increased. Two 14-in. two-high stands between rougher and finishing stands replace the passes lost on the rougher.—Steel, Nov 6, p96

Report to Management

Modern Machines and Methods—Management Tools for Business

Here is the first part of a two-part report that is designed to help management get acquainted with the newest in office equipment and methods. Almost any office or business can employ some form of mechanization in its routine. Mechanization, with proper methods, can cut costs. But that is only one advantage. In order to meet competition and stay in business, management must have a thorough knowledge of every-day facts and figures. Today's office equipment is specifically made to give you facts and figures, and in the quickest possible time with a minimum of effort.

The second part of this report will appear in our March issue. Look for it. It will show you how business systems and office procedures are designed. It can help you analyze your business so that you will get maximum efficiency.

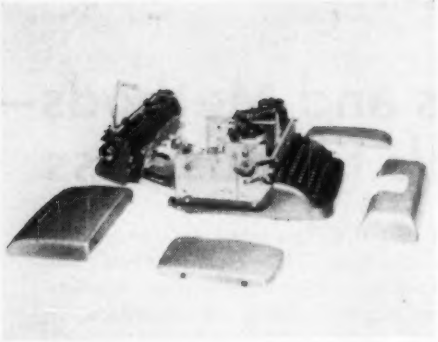
Writing Machines

THE TYPEWRITER has come a long way since its invention in 1873. Today's machines offer many improvements designed to reduce operator fatigue and increase production. Keyboard margin settings, streamlined mechanisms, key releases for jammed typebars, interchangeable cylinders, and an adjustable key pressure are some of the features available on modern machines. Even Arabic and Hebrew type styles can be obtained.

New and improved electric models, adaptable to all typewriting work, are making electric typing an important technique in modern, scientific office management.

When should you buy an electric typewriter? If you are looking for these advantages:

- Better appearance of work
- Ease of operation
- Increased production
- Better stencils
- Good readability, and
- Higher operator morale,



EASY BREAKDOWN of this typewriter allows speedy access to parts for mechanical adjustment. —Remington Rand, Inc.

SOUNDPROOF CASE (unshaded part of picture) makes this electric typewriter inaudible at a short distance.—Underwood Corp.

Then, the electric typewriter is the answer

Fanfold Writing Machine

Where preparation of forms with one or more copies is required, use of the fanfold writing machine becomes desirable. Forms and carbon paper in long, continuous strips are loaded into the machine. The clerk merely types and removes each completed set. The removal operation automatically places the next set of forms and the carbon paper in typing position. This method assures maximum efficiency and quality results at low cost.

Flat Writing-Surface Machine

Forms of any shape and size (within limits of the machine), prepared in original only or numerous copies, can be handled easily on the flat writing-surface machine. Keeping records in bound books is now a relatively simple operation.

When typing, the writing mechanism moves over the forms from left to right. The forms remain stationary in their flat position until the typing is completed.

In single-copy work, a stack of forms may be placed on the writing surface and then removed, one at a time, as each form is typed.

In multi-copy work, the carbon paper may be inserted between the copies after the forms are clamped in typing position. When the typing is completed, all the carbon sheets may be pulled out in one operation before the forms are removed from the machine.

How to Use a Writing Machine

Typewriter utilization should be thought of in terms of a typing station: desk, chair, copyholder, and typewriter.

The typewriter should be placed as high as necessary to promote the fastest typewriting with the least effort. Fast, accurate typewriting requires that the forearms and hands of the typist be approximately parallel to the slope of the typewriter keyboard. If necessary, raise or lower the typewriter platform.

Modern typing chairs will encourage

FRONT COVER—Business machines range from simple to complex in performance, but all belong in mechanized offices. Shown is a Burroughs calculator, Underwood Sundstrand posting machine, National Cash Register accounting machine, and a Remington Rand punched-card machine.

good sitting posture. They will pay dividends in comfort for the operator and increased output for the office.

The advantages of typewriter height adjustment and a proper posture chair can be maintained only by correct placement of reading copy. Reading matter should be perpendicular to the line of sight and directly in front of the typist. Mechanical copyholders, designed for maximum reading efficiency, are recommended.

Here are a few typing short cuts that will help save time and money.

When making corrections, the carriage should be moved to the extreme right or left to prevent erasure grit from falling into the machine. The keys should be tapped lightly until the color of the correction matches that of the original writing.

In correcting carbon copies, after the necessary erasure has been made, adjust the ribbon control indicator to stencil position. Strike the proper key for an impression on the carbon copies. Then switch the control indicator back to the ribbon and again strike the proper key. This will permit a perfect match of the typing on the original and will leave the typing on the carbon copies with an equal density of color.

A sheet of heavier paper placed at the back of a carbon pack will help keep the manifold paper smooth and free from creases.

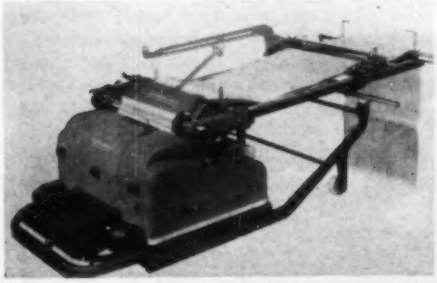
Supplies for Writing Machines

Even the best machine in the world can be only as good as the materials it works with. Typewriter ribbons and carbon paper should be chosen with care and the manufacturers' recommendations in mind.

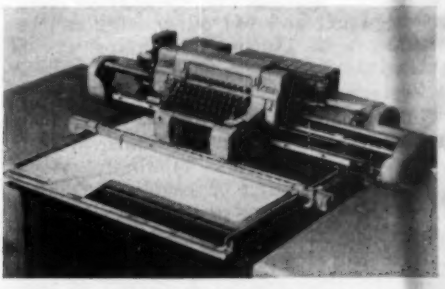
Ribbons should be selected on the basis of the kind of work done. For extra carbons, the ribbon must be able to stand up under the hard usage required. Originals that must have high eye-appeal call for a ribbon that will give a clean impression and a sharp outline.

A nylon ribbon has recently been placed on the market. In electric typewriter work, where many carbon copies are needed, it is claimed that the nylon ribbon will justify its extra cost in a short time by eliminating frequent ribbon changes.

Most manufacturers make a carbon paper to suit particular needs. Carbons in sizes, weights, colors, finishes, and packaging for the specific job are available. Used according to the manufacturers' advice, carbon papers will provide superior copies, easy reading, clean handling, and an economical life.



***WRITING CONTINUOUS LENGTH FORMS** on this fanfold writing machine equipped with carbon paper in long sheets or carbon-paper rolls is a fast, economical method for producing multi-copy records.—Underwood Corp.*



***FLAT-WRITING SURFACE** of this machine makes typing possible on odd-sized forms. Writing mechanism moves over forms for typing in any desired location. Machine is electrified. — Underwood Corp.*

Duplicating and Printing Equipment—Mailing Machines

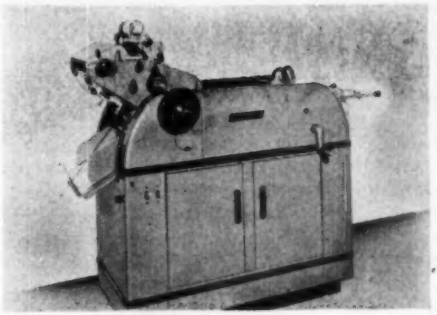
THE RANGE of office printing equipment is wide—from mimeograph machines to offset-printing machines that prepare work comparing favorably with full-scale printing presses. Duplicating machines make possible the distribution of reports, charts, and information within the office in the fastest possible time and with a minimum of cost.

Where permanent records and better appearance are desired, offset-printing machines are recommended. Photographs, intricate line drawings, and complex forms are easily handled by some of the newer offset-printing methods. Plates for the process can be made right in the office, thus eliminating an outside platemaker's expense.

Mailing machines include postage meters and mail openers. Advantages of postage meters include: (1) postage in your office for any kind of mail; (2) time is saved as the machines can stamp, postmark, count, and stack mail in one operation; (3) postage is theft-proof and waste-proof; and (4) advertising can be printed with the meter stamps at no extra cost.

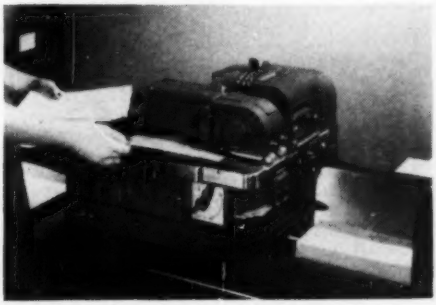
Postage meters are not limited to printing postage on evelopes. They also print stamps for package mail.

The mail openers eliminate slow, clumsy handslitting of envelopes. Time saved in machine opening permits the mail to be distributed sooner. Most machines will take envelopes of varying sizes and thicknesses. A variety of machines, both hand and electrically operated, are available; their selection depends on the volume of mail to be handled. Capacities range up to about 500 letters per min.



***AUTOMATIC CONTROL** of ink and moisture is featured in this duplicating machine.—Addressograph-Multigraph Corp.*

***THIS DUPLICATING MACHINE** will handle almost any type of stencil. Capacity is 140 copies per minute.—A. B. Dick Co.*



***POSTAGE METER** will seal, postmark, print postage, and count letters at a speed of 175 per minute.—Pitney-Bowes, Inc.*

STATISTICAL INFORMATION is a by-product of routine bookkeeping on this accounting machine. —Burroughs Adding Machine Co.

WRITING AND ACCOUNTING, combined on this machine, saves time in accounting operations.— National Cash Register Co.

Modern Accounting Machines and Systems

HAND-POSTED accounting records are proving to be inadequate as organizations become more complicated. Figuring, writing, and proving are each separate steps in the hand method of accounting. Usually this leads to duplication of effort, errors, and high cost. Improved methods employing mechanized accounting will produce accurate records in much less time and at a considerably lower cost.

Practically all types and sizes of businesses can apply these machines to an advantage. Utilities, retail and service organizations, freight shippers, governments, banks, payroll departments, manufacturing companies, to name a few, all employ accounting machines in their operations.

Today's machines vary in complexity. You can obtain a simple hand-operated computer that will add, subtract, multiply or divide; or you can obtain a machine that proves, counts items, selects proper columns, prints as many as 21 figures, ejects and stacks forms, and does all this automatically. How to use them can be described by analyzing a few businesses.

Property Tax Accounting—A machine bookkeeping system will provide a simplified method of accounting, improve service, and speed up collections. In the unit accounts method, all taxes accumulated against each property are correlated and compiled under one head.

All unpaid tax items are assembled by property location. Outstanding taxes due against any one property is brought together on one card.

Then the unpaid balances are posted to the unit cards by machine. Simultaneously, a control sheet is made and verified. A general accounting machine is used for this operation.

With the machine system, only two operations are required: (1) a receiving or receipting operation and (2) a posting operation.

The form of receipt for property taxes indicates the year of tax against which payment is to be applied, receipt number, name of taxpayer, location of property,

reference number, date of payment, amount of tax, lien advertising charges, penalties, and total tax.

When a payment is made, receipt forms are placed in the bookkeeping machine over the collection register. A copy of each receipt as issued is simultaneously duplicated on the collection register. At the conclusion of the daily collections, the total of the various machine registers is taken to determine the amount to be deposited in the bank. Duplicate receipts are sorted by year of tax in preparation for the posting or "breakdown" operation.

Two forms are used for posting, both being posted in one operation: (1) the unit account card and (2) the delinquent tax ledger journal. The unit account card provides space for location of property, assessment data, reference or account number, name and address of owner, and space for 6 years of tax.

The registers of the bookkeeping machine are so designed as to accumulate only the base amount of tax. Penalties and costs are not accumulated. The advantage is that the balance column of the unit card indicates at all times the amount of base tax outstanding, without adjustment for any penalties or costs. Thus, a detailed check against the control accounts can be easily made.

A delinquent-tax ledger journal sheet is employed for each year of delinquents posted. This operation provides the breakdown by years of tax of the items appearing on the collection register for the same period.

Totals of the sheets used in the posting operation must equal the amount of collections, as indicated on the collection register for the same period. Likewise, a proof of posting is automatically obtained by the machine.

Monthly controls of balances outstanding are made by preparing summary sheets indicating the totals collected during the period as localized against the respective years. The amounts collected are then deducted from the balances outstanding at the end of the previous period to arrive at the amount of the uncollected balance.

ELECTRIFIED KEYBOARD of this accounting-writing machine cuts down on required operator movements.—Remington Rand, Inc.

Depositors' Checking Accounts—Machines specifically designed for bank use can cut costs by reducing the number of operations and the time involved.

Depositors' ledgers are posted in one operation; depositors' statements in another. Necessary totals are automatically printed at the end of each run for control and proof purposes. The number of checks posted daily can be automatically printed on each account.

After posting check totals to the account, additional checks that are entered as single items are automatically counted and added to the total. The combined total check count prints with the account balance in one operation.

Here is how a Syracuse bank solved its problems in posting installment-loan payments. File clerks had to match as many as 1,500 payments to ledger cards each day. The following day, the posting clerks posted and the file clerks refiled.

This procedure meant double handling

of the ledger cards. It also meant that the cards would be out of the file for an appreciable length of time. Although the system was considered satisfactory for seven or eight thousand accounts, twice that number would make it impractical.

This is what they did. They designed a posting desk, 9 ft. long. A notice clerk sits at her typewriter with a work area to the left and the ledger cards to the right. The posting clerk works with ledgers to her left and an adding tabulator to her right. The notice clerk and the posting clerk are jointly responsible for balancing the ledgers.

Only one ledger is pulled at a time for posting; the notices are maintained in the active file and a sheet listing of these notices is recorded. At no time are more than 50 cards out of file at one time, and then only for posting.

The adding tabulator permits recording of the coupon number, the coupon payment amount, and the ledger card old balance all in one operation. Ledger cards are still predetermined so that a posting clerk with a rubber stamp quickly hand-posts the cards and then reruns the new balance. The 50 cards are then immediately refiled, and the operation is repeated on succeeding ledgers.

Advantages of the new system are: (1) the same amount of work is done with two less employees than before, (2) remaining employees work shorter hours, (3) a much greater volume of loans can be handled before another posting unit is required, and (4) ledgers are easier to balance.

Payroll Accounting—Again mechanized equipment can simplify payroll accounting, increase accuracy, speed the work, and exercise better control.

From the weekly time report of each employee, the hours worked and the pay rate are entered in a payroll machine. The machine multiplies the two figures together and prints a gross figure on a tape.

If the employee worked overtime and

***THIS ACCOUNTING MACHINE** has many features designed specifically for use in bank-accounting procedures.—Underwood Corp.*

receives a premium, the operator next multiplies the number of premium hours by the premium rate. The machine prints this figure and adds it to the previous gross total. This amount, though printed, is retained in the machine for future use. Deductions are then made, and a total deduction figure is printed.

The deductions are subtracted from the gross earnings ("remembered" by the machine), and the net earnings figure with the date is printed as a final entry.

Retail and Service Organizations—It is easy to obtain usable figure facts about your sales staff. And these facts will enable the business to maintain an advantage against competitors.

For example, by adding each clerk's sales slips, you can determine the relative value of the clerks. A distribution of sales, purchases, and expenses by departments, and a day-to-day balance of cash, receivables, payables, etc. can be also obtained with an adding-subtracting machine. It takes only a few minutes each day and it can reduce costs and stop profit leaks.

New Machines to Speed Your Business

Accounting Machine—Quarter turn of a knob changes the machine to a different accounting operation. Each control unit has four complete changes. Units can be changed for additional operations.—**Burroughs Adding Machine Co.**

Folds 10,000 Sheets per Hour—Electric folding machine can perform eight basic folds. Feeding and stacking are done at same end of machine. Folder handles wide variety of paper stock, sizes, and weights. —**Pitney-Bowes, Inc.**

Typewriter Comes Apart—Standard office typewriter has construction feature allowing it to be easily broken down into basic components for access to all vital parts for mechanical adjustment. — **Remington Rand, Inc.**

Machine Does 70 Functions—New accounting machine features two keyboards. Lower keyboard controls an electric typewriter; the upper handles full accounting operations. It has 10 add and subtract counters and can add or subtract in any combination of counters.—**National Cash Register Co.**

Speeds Forms Writing — Forms-writing machine has been designed for typing continuous fanfold or open-web forms. Two partial carriage returns and intermediate left-hand margin stops save tabulating and carriage travel. Decimal tabulation keys can be added.—**International Business Machines Corp.**

Bank Accounting Machine—It is designed for posting depositors' checking accounts. Ten-key keyboard plus automatic addition, subtraction, check count, balances, register sub-totals, register totals, carriage opening, and closing are some of the features of the machine.—**Underwood Corp.**

Photo-offset Plates in Your Office—Device quickly produces photo-offset duplicating plates of bulletins, line, half-tone and photographic subjects. No special skill is required to operate it and plates can be made in the office.—**Remington Rand, Inc.**

Prints Letters and Numbers — Machine writes names and descriptive data from plates and writes, distributes, and adds figure information simultaneously. Figure information is automatically set up and printed as plates are sensed. Totals are automatically accumulated. — **Addressograph-Multigraph Corp.**

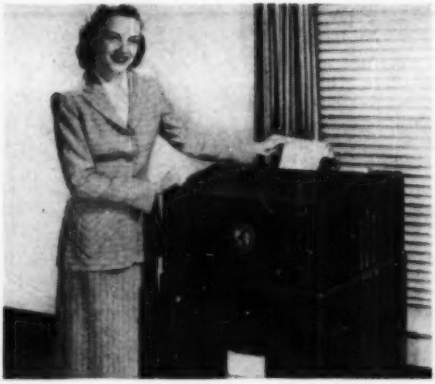
Table-top Mimeograph — Electric-drive machine produces 140 copies per min. Operator can sit down while mimeograph works. Machine is adaptable for hand feeding of collated sets of irregular sizes of paper and card stocks. Standard stub, stubless and universal stencils are easily attached and removed.—**A. B. Dick Co.**

Portable Posting Machine—Operator sets up significant figures on the keyboard and then depresses the motor bar. Machine automatically provides, as required, nonprinting of amounts, tabulation, non-adding of amounts, selection of columns, additions, and subtraction; it also prints debits in black and credits in red.—**Underwood Corp.**

Printing Multiplying Punch — This punched-card accounding machine will compute, print, and punch at a rate of 1,200 complete calculations per hr. It can sense two pre-punched factors, compute the product, punch it into a card, and print the factors and product on a tape. Either one or both factors can be entered manually on a keyboard. Results are the same.—**Remington Rand, Inc.**

Multiplies Automatically—Calculator features simultaneous automatic multiplication. Tabulator can be cleared by extra-deep depression of the tab key at the extreme left.—**Marchant Calculating Machine Co.**

Small Business Postage Meter—Here is a low-cost machine for the small businesses where the mail volume is not too great. Unit is hand operated and will do practically all the things the larger machines will do including printing an advertisement.—**Pitney-Bowes Inc.**



TABULATING MACHINE controls the computing and punching of extensions into tabulating cards. —Remington Rand, Inc.

ACCOUNTS are posted (left). At same time, a punched-card replica of posted entry is automatically created (right).—Remington Rand, Inc.

Punched-Card Accounting Methods

REPORTS AND DOCUMENTS, prepared rapidly with punched cards, will give access to information needed for the close supervision and long-range planning so vital to efficient management. The flexibility of the punched-card system allows it to be used for payroll analysis, production control, census reports, and statistical studies.

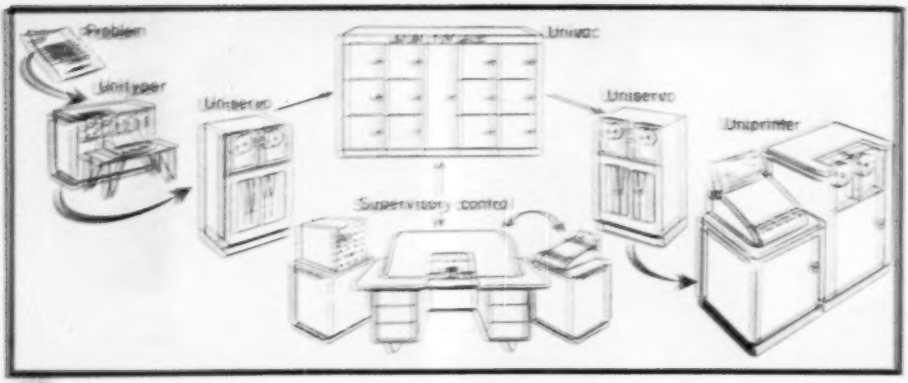
How It Works—The punched-card system is a high-speed, mechanized method of translating and transcribing written data. Heart of the method is an oblong card bearing columns of digits in a field providing for thousands of figure combinations. Holes can be punched mechanically for numerical and/or alphabetical characters.

A sorting machine will perform correlating, sorting or filing functions. Except for initial punching with a typewriter-like keyboard, all processes are automatic. Once an original has been punched, there are machines to verify, units to duplicate the original, interpreters that print on the cards the numerical and/or alphabetical information, and a summary punch that selects details for automatic preparation.

Where It Is Used—Punched card accounting is a valuable management tool in manufacturing control. It helps plan, execute, and evaluate the results of a program of material conversion. This is what it can do:

- Forecast statistics and analyze current sales to provide a basis for planning future production.
- Provide basic records of specifications to permit the controlled calculation of requirements for materials, manpower, and facilities.
- Provide schedules and control documents for directing the manufacturing program.
- Provide control reports.

Government officials may find the punched-card method a solution to their tax-accounting problems. The city of Havana, Cuba, reports a decrease of 44% in tax delinquency. The installation has provided Havana's officials with a system that is accurate and flexible and that has reduced operating costs considerably.



METHOD in which information is processed from problem to finished report is shown in this diagram of the UNIVAC.—Remington Rand, Inc.

Electronic Computers for Business

MATHEMATICAL ANALYSES can now be applied to business operations. The electronic digital computer does away with the numerical computation that often made an analysis impossible.

This is what the Remington Rand UNIVAC (Universal Automatic Computer) does. Each group of data is recorded on a separate input tape by means of magnetic-tape devices. Information from each tape is matched and manipulated electronically by the computer as necessary. Output tapes record the several types of results, both summary and detailed in nature. The machine can also execute a series of instructions if a given situation exists.

Now let's follow the machine through a typical inventory problem. Assume that the computer has already sorted all activity by stock number. The problem now is one of applying activity to all balances to arrive at new balances. Basically this is a matching operation (on stock number). Each item applies some simple rules to effect the proper additions and subtractions.

Valuable "byproducts" can be created during a typical operation. An example would be the costing of issues segregated from the daily transactions for cost-distribution purposes. The desired unit costs for each item could be maintained in the balance file by means of cost information extracted from the daily receipts. Unit cost multiplied by the extension quantity and the data, complete with cost account references, is written on an output tape.

Next, stocks are compared with requirements. Needs for raw materials and parts are computed in accordance with definite production schedules.

We wish to express our appreciation to the following companies for their valuable assistance in the preparation of this report: A. B. Dick Co., Addressograph-Multigraph Corp., Burroughs Adding Machine Co., Friden Calculating Machine Co., Inc., International Business Machines World Trade Corp., Marchant Calculating Machine Co., The National Cash Register Co., Pitney-Bowes, Inc., Remington Rand, Inc., and Underwood Corp.

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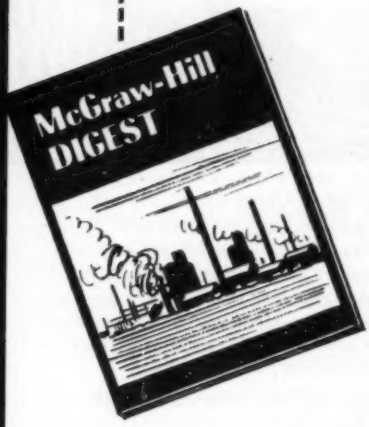

Every month the Digest brings you a summary and analysis of the latest developments in business, industry and science. These articles are directly or indirectly helpful to you in your work. But the Digest offers many other services. We want to be sure that you, as one of our regular readers, are enjoying full use of all its benefits.

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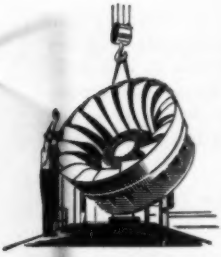

PRODUCING economical electric power for millions of homes, thousands of factories and public works is one of many jobs assigned to Allis-Chalmers machinery.

Today, hydro-electric projects of every size and capacity employ Allis-Chalmers turbines and generators to lower industrial production costs, raise living standards everywhere.

Allis-Chalmers makes complete turbine and generating units in either impulse, Francis or propeller types. In addition, Allis-Chalmers builds complete steam and gas turbine-driven generating plants—also supplies switchgear, transformers, motors, control, many other types of electric power equipment.

In fact, *every* basic industry—mining, ore processing, cement, steel, flour, textiles, pulp and paper—looks to A-C as one responsible source for a complete line of dependable primary equipment.

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Production Ideas

from Manufacturers' Catalogs

2-1 Power-plant Instruments—Minneapolis-Honeywell Regulator Co. 32p. Catalog 90-1 describes Electronik potentiometers, gages, thermometers, and other instruments needed for steam stations.

2-2 Transforms Power—Allis-Chalmers Mfg. Co. 16p. Power and distribution transformers are covered in bulletin 01B6186B, as well as step regulators, pole-type regulators, and unit substations.

2-3 Fork Lift Trucks—Mobilift Corp. 6p. Two new 2,000-lb. Lev-R-Matic Drive fork trucks—one "stand up" and the other "sit-down"—are described in bulletin M-410.

2-4 Cylindrical Grinder—Landis Tool Co. 20p. Type CH 10-14 in. plain hydraulic grinder is covered in catalog B-50.

2-5 Power Transmission—General Motors Overseas Operations. 136p. "Power Goes to Work" is an illustrated handbook on general power transmission as well as that in automobiles, airplanes, and ships. It may also be obtained from nearest General Motors office.

2-6 Kel-F—M. W. Kellogg Co. 12p. Three bulletins—2-10-50, 3-10-50, and 4-10-50—cover heat treatment, molding, and dispersion forms of Kel-F plastic.

2-7 For Foundrymen—Whiting Corp. 38p. Bulletin FY-140-R is a pocket-size handbook giving much information, tables, and other data of use to foundrymen.

2-8 Ocean Shipping Handbook—Board of State Harbor Commissioners. 64p. Ready reference on the Port of San Francisco tells world traders of the facilities and advantages that the port offers.

2-9 Controls Synchronous Motors—Westinghouse Electric International Co. 8p. Bulletin B-4379 describes Slipsyn control for all types of synchronous-motor drives.

2-10 Teflon—E. I. du Pont de Nemours & Co. 12p. Teflon, or tetrafluoroethylene resin, is shown by booklet A-478 to be an outstanding material for gaskets and packing.

2-11 Unitized Plants—Iowa Mfg. Co. 20p. Bulletin 2-7-48-25M describes portable and stationary crushing, screening, and washing plants for aggregate production jobs.

2-12 Single-drum Hoist—Joy Mfg. Co. 16p. Bulletin 76-X describes line of single-drum hoists for mines, construction jobs, oil fields, and industrial plants.

2-13 Heavy-duty Conveyor—Barber-Greene Co. 8p. Bulletin 374 shows how model 374 portable conveyor speeds materials movement in industry and construction.

2-14 Speed Control—International General Electric Co. 26p. Catalog GEA-5334 covers benefits of adjustable-speed drives and check list for drive selection.

2-15 How to Store Plasticizers—Monsanto Chemical Co. 12p. Technical bulletin 0-69 discusses the requirements of handling and storing large volumes of plasticizers.

2-16 Boring and Thread Grinding—Ex-Cell-O Corp. 12p. Bulletin 31101 presents style 1212-A double-end boring machine. Bulletin 14091 describes styles 33 and 33L precision thread grinders.

2-17 Materials-handling Equipment—Rapids Standard Co., Inc. 24p. Catalog GC-51 tells how to use gravity conveyors, powered conveyors, and trucks.

2-18 Machine Tools—Cincinnati Lathe & Tool Co. 26p. Five bulletins cover Standard lathes, Cintilathes, 21-in. sliding-head floor drill, and 3-ft. radial drill.

2-19 Money-saving Trucks—Studebaker Export Corp. 16p. Bulletin F698-E gives complete specifications on Studebaker trucks and truck accessories.

2-20 Conveyor Chains—Mechanical Handling Systems, Inc. 65p. Bulletin CH-1 covers all types of conveyor chains and has a valuable data section on the design of chains, sprockets, and shafts.

2-21 Straddle Carriers—Ross Carrier Co. 10p. Series of bulletins give design information and specifications on Series 70, 80, and 91 straddle carriers.

2-22 Modern Packaging—Package Machinery Co. 4p. Form 126-9-50 preaches lower costs and larger sales, and shows how modern packaging machines bring them.

2-23 Trucks and Buses—Reo Motors, Inc.

Production Ideas (Cont.)

36p. Reo's complete line of trucks and buses is presented in one bulletin, while the second covers "Gold Comet" engines.

2-24 **Steam-plant Equipment**—Yarnall-Waring Co. 12p. Blow-off valves, steam traps, and other equipment needed in steam plants are described in bulletin G-1307.

2-25 **Coal-tar Chemicals**—Koppers Co. 44p. "Chemicals from Coal" describes in detail the many chemicals available from coal-tar processing, such as tar acids, tar bases, and aromatic hydrocarbons.

2-26 **Construction Insulation**—Owens-Corning Fiberglas Corp. 40p. Five bulletins—30-A, 37-A, 37-B, 37-B2, and 37-B3—cover duct insulation, Quonset-hut insulation, insulating form board, roof insulation, and floor-slab edge insulation.

2-27 **Revolving Cranes**—American Hoist & Derrick Co. 24p. Catalog 400-R-2 is a picture story of dam construction using American Revolver cranes.

2-28 **Carbide Rock Bits**—Rock Bit Sales & Service Co. 20p. Pamphlet tells how to get the most service from carbide cross-type and chisel bits.

2-29 **Gear Drives**—Link-Belt Co. 16p. Catalog 2247 gives complete data on 1- to 75-hp. integral gearmotors, helical-drive Motogears, and separate helical-gear drives.

2-30 **Protective Resin**—Hercules Powder Co. 19p. Booklet 400-382A tells how Polypale resin improves varnishes.

2-31 **Air Gage**—Taft-Peirce Mfg. Co. 16p. CompAIRator air gage and accessories are described in catalog 610.

2-32 **For the Machine Shop**—Rockwell Mfg. Co. 24p. Catalog A48 covers the Delta line of industrial machine tools, including drill-presses, grinders, band saws.

2-33 **Adding Machines**—Burroughs Adding Machine Co. 10p. Form DM-1162 describing different types of machines is available in English, Spanish, Portuguese, Italian, French, German, and Dutch. Mark coupon which language desired.

2-34 **Speed Reducers**—Falk Corp. 28p. Two engineering bulletins—1105 and 2104— describe concentric-shaft speed reducers and small right-angle speed reducers of horizontal and vertical types.

2-35 **Three-spindle Lathe**—Bullard Co. 8p. Bulletin MAH-G-2-10-48 illustrates and describes model 30H Man-Au-Trol horizontal lathe that completes three workpieces in each cycle. Operation can be controlled automatically.

2-36 **Story of Heat**—Dow Chemical Co. 16p. Form 1C5A-5M-448 is "The Dowtherm Story"—the modern answer to high-temperature processing problems. Dowtherm A is serving many industries in indirect systems as either a heating or cooling medium.

2-37 **Hydraulic Control Valves**—Logansport Machine Co., Inc. 22p. Balanced-pressure, piston-type hydraulic control valves are described in catalog 200-S4.

2-38 **Off-the-highway Trucks**—Mack-International Motor Truck Corp. 36p. Four bulletins describe dump trucks with payload capacities of 30,000 to 60,000 lb.

COPIES of these manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 W. 42nd St., New York 18, N. Y., U. S. A.

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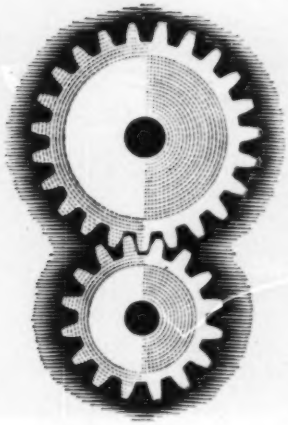

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IN NORWAY TOO

In all countries throughout the world, forward-looking companies have a common objective: To reduce costs and increase production to meet the requirements of today's markets. In Oslo, Norway, Messrs. Askim & Haasted, Clark distributors, are helping Norwegian industry to discover that costs of moving materials can be reduced and production increased by the application of modern methods and machines.

Much thoughtful attention has been focused by the Norwegian State Railways on the problem of handling LCL shipments. That good progress has been made is evident from an article by Mr. H. F. Haraldsen, in charge of freight station service, appearing in the NSB house journal.

"Everybody who has to do with LCL shipments knows that this part of our work is very costly. Analysis proves that costs are divided one-third for loading, one-third for transport and one-third for unloading. To reduce these costs as much as possible, it is necessary to employ practical methods and to make greatest possible use of mechanical aids.

"Latest development by the Norwegian State Railways, in this area of transport-handling methods, is the installation of five Clark Yardlift-20 fork-lift trucks of 900 kg capacity, and equipped with pneumatic tyres. These are in operation at the Oslo warehouse; and additional units of the same type will be installed at other stations as soon as possible. These trucks are supplemented by hand-operated jack-trucks.

"By this method, several comparatively small packages are assembled into larger unit loads on pallets, to be piled in storage, loaded into cars and unloaded, by the fork-trucks. These operations are carried on with almost entire absence of physical strain. Many large packages can be handled on the forks without use of a pallet. Also a crane attachment can be used in place of the forks; and attachments are available for special assignments such as handling fish cases, snow removal and others.

"Handling of freight is much faster by this method, and less damage occurs. Costs are reduced to a minimum, because storing freight packages on pallets eliminates many unloading and reloading operations. Delivery is much easier and faster. Thus we give our customer better service."

To learn how fork-lift trucks and industrial towing tractors are achieving a profitable revolution throughout the world, consult your local Clark distributor. For his name please write to Export Division, Clark Equipment Company.

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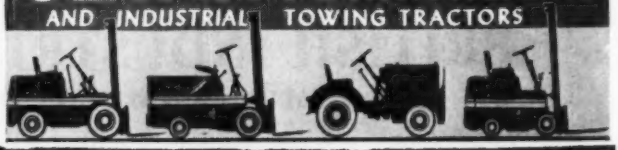

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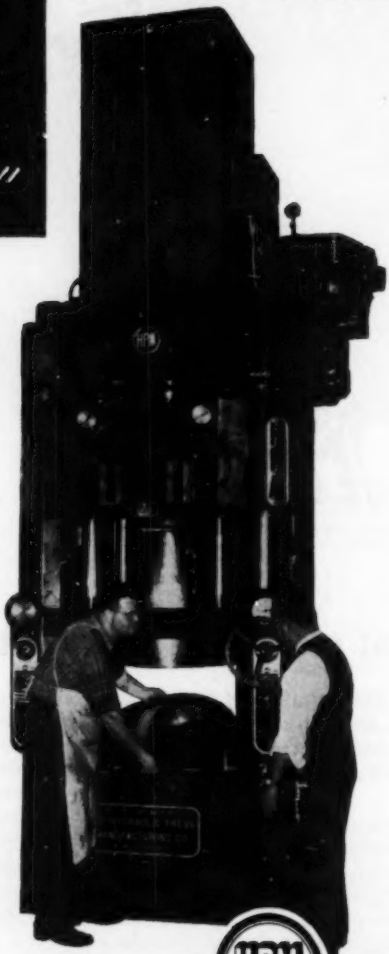

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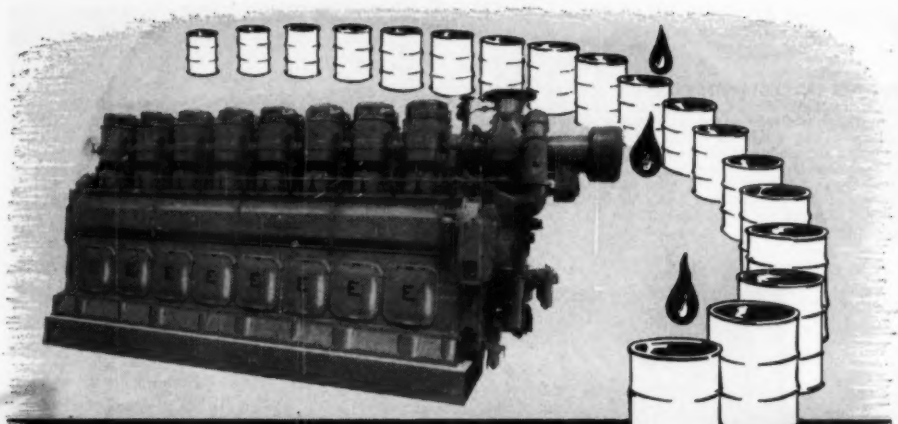

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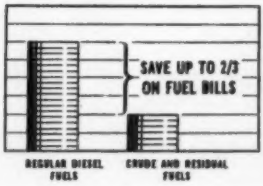

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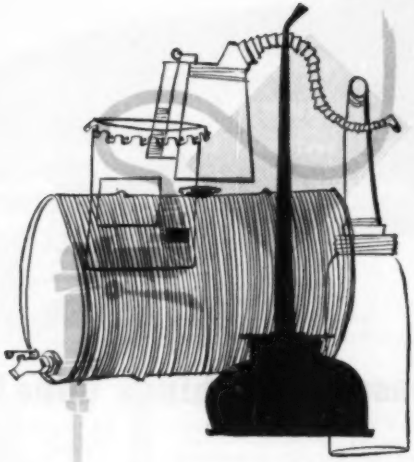
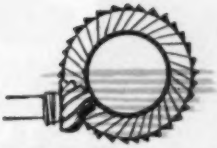
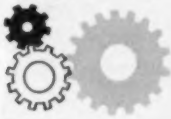


More Protection through Better Lubrication

CONSTANT IMPROVEMENT in the protective value of lubricating oils and heavy greases lengthens the life of moving machinery—protects against friction—cuts the cost of replacements and repairs. Monsanto has long been prominent in this fight against friction—helping oil producers and refiners develop better protection by blending their oils with petroleum additives. There are many kinds of these Monsanto additives. Each has special properties.

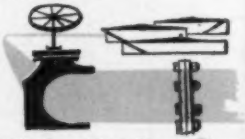


Santopoid* gear-lubricant additives fortify heavy-duty gear lubricants—make them better able to combat shock and friction in modern motor cars, trucks and industrial equipment.



Santopour* pour-point depressants, when blended with lubricating oils, give them free-flowing and pouring properties in cold weather.

Santolube* additives inhibit corrosion and sludge formation. They also add detergent values to motor oils. Inhibitor-detergent values can be specially developed for premium oils and heavy-duty lubricants.



Santodex* enables refiners and compounders to obtain higher viscosity indexes from various lubricating oil stocks in order to meet specification requirements. Monsanto Santolene *C acts as a rust preventive in pipe lines and tanks for light petroleum products.

**Trade-mark registered.*

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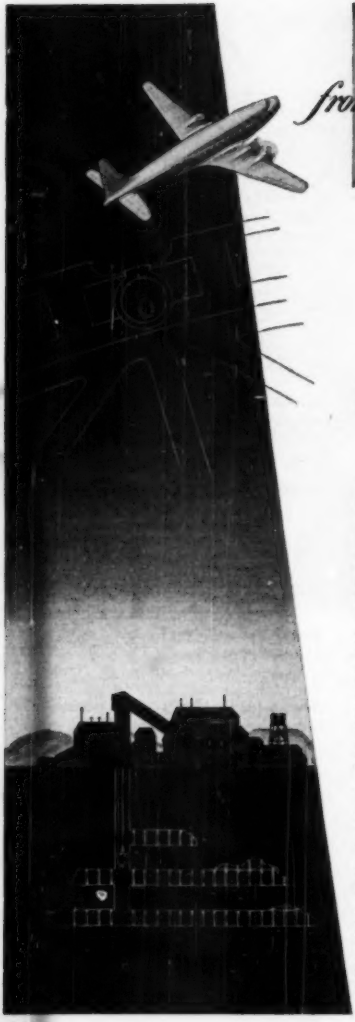

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to **Z** *inc Mines...*

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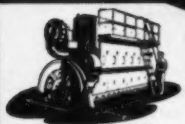

DIESEL ENGINES FOR MARINE AND STATIONARY SERVICE FROM 10 TO 9600 H.P.

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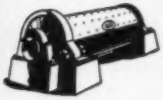

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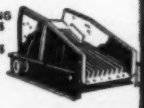

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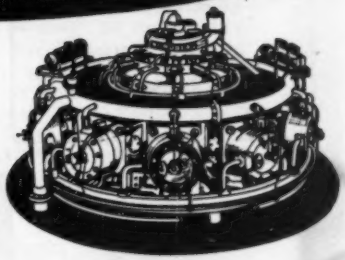


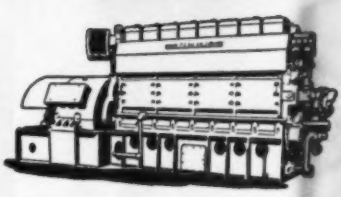
(RIGHT): The Nordberg Radial Diesel, a 2-cycle 11-cylinder unit, develops 1800 horsepower or 1250 kilowatts. Available for oil or gas operation.

• • •

(RIGHT): Nordberg 4-cycle Diesel generating units are available in sizes from 175 to 1760 horsepower.

• • •

In addition to the units illustrated, Nordberg builds 2-cycle Diesel engines in several cylinder sizes, developing from 1000 to 9600 horsepower.



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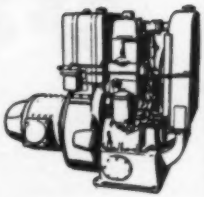

(ABOVE): 114.30mm x 133.35mm Diesels available in 1 and 2 cylinder units up to 30 horsepower for direct drive, as electric generators or as pumping units.

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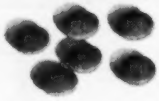

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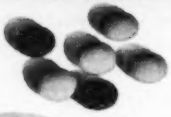

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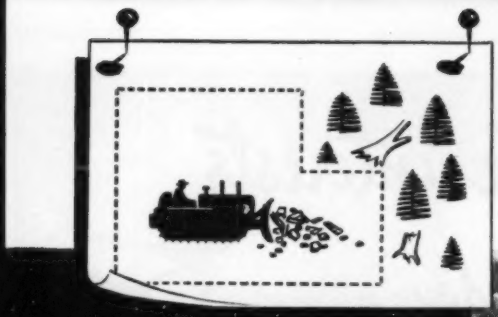

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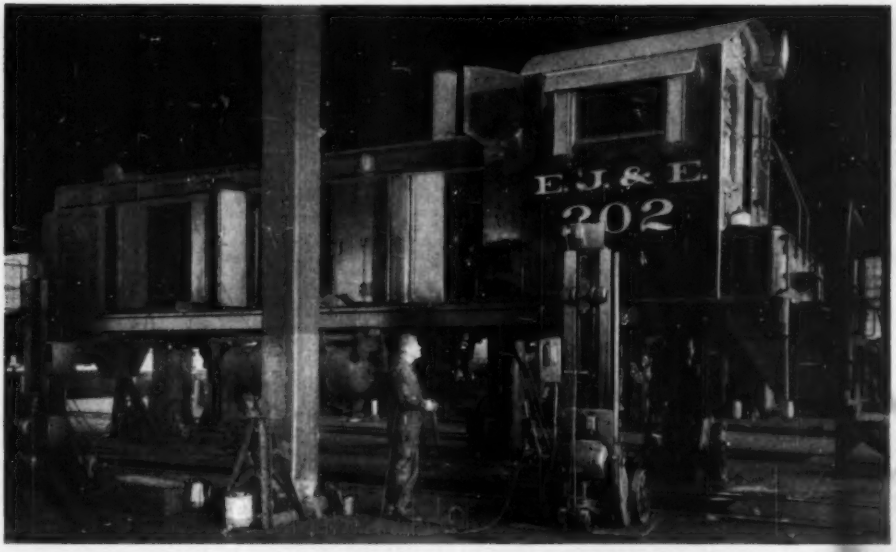

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	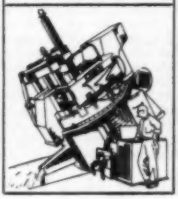	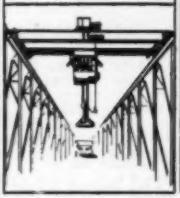	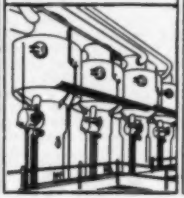	

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HOW TO CHART TIMESTUDY DATA

By PHIL CARROLL, Professional Engineer; Author: *Timestudy for Cost Control* and *Timestudy Fundamentals for Foremen. McGraw-Hill Industrial Organization and Management Series.* October, 1950. 323 pages, $5.00

This is a complete manual for industrial engineers and shop executives on the fundamentals and methods of charting timestudy data and on expanding the productivity of the timestudy dollar. The book shows how to set up timestudy data in more efficient form in various types of charts which solve everyday problems more quickly and correctly. Each of the six different forms of construction is built up in a set of step-by-step illustrations, and the general conditions for the use of each are explained. The author shows throughout *how to reduce the cost per standard*, and emphasis is placed upon extension of wage incentive application. There is helpful information on the standard data method, improving timestudy methods, forms of standard data, standards for curve drawing, timestudy data curves, curves as planning controls, and equations in timestudy.

STURGIS STANDARD CODE OF PARLIAMENTARY PROCEDURE

By ALICE F. STURGIS. Foreword by Harold H. Burton, Associate Justice, Supreme Court of the United States. Introduction by Owen J. Roberts, Dean, The Law School, University of Pennsylvania; former Associate Justice, Supreme Court of the United States. November, 1950. 280 pages, $2.50

Here at last is a handbook of parliamentary procedure that is completely modern, comprehensive, authoritative, and easy to use. In the most simple and logical manner it presents all the rules of modern parliamentary law for all organizations, clubs, civic groups, and governing bodies. The first part of the book discusses principles of procedure and general rules; order of business, presentation and precedence of motions, methods and procedure of voting, etc. Part II explains how to set up a new organization; how to write its constitution, by-laws, and standing rules; the duties of officers and committees; the rights of members, etc. Part III is a detailed reference guide to motions. The author is well qualified to write on parliamentary procedure, having made it a lifelong study, with special work at Stanford University and in Paris.

CIVIL ENGINEERING HANDBOOK, New Third Edition

Editor-in-Chief, Colonel L. C. URQUHART, Assistant Chief Engineer, O. J. Porter and Company, Newark, New Jersey. October, 1950. 976 pages, $8.50

In point of view, comprehensiveness, organization, and format, the *Civil Engineering Handbook* has proven invaluable to practicing engineers and to students. In this new edition all obsolete information has been eliminated and the developments of the past eight years included. As before, this handbook comprises ten major sections on: Surveying; Railway, Highway, and Airport Engineering; Mechanics of Materials; Hydraulics; Stresses in Framed Structures; Steel Design; Cement and Concrete; Soil Mechanics and Foundations; Sewerage and Sewage Disposal; and Water Supply and Purification. The book gives an unusually thorough treatment of these fundamental divisions of civil engineering, so that the specialist, suddenly confronted with new problems in a related field, will find the complete theoretical and practical information he needs to solve any problem.

THE TECHNIQUE OF EXECUTIVE CONTROL, New Seventh Edition

By EDWIN H. SCHELL, Professor of Business Management, Massachusetts Institute of Technology. November, 1950. 296 pages, $3.50

This book has become the standard authority on executive supervision; in a field where proof of effectiveness is quickly established, this book has been in constant demand by managers, foremen, and other executives in business and industry and has been widely adopted as a textbook throughout the world. This book drives squarely at the solution of problems of executive-employee relationships. Many new aspects of these supervisory responsibilities have been added, such as problems of stimulation, collaboration, and special aspects of proficiency. New case problems and accompanying discussion questions have been added, as well as a new chapter on "Technique of Executive Improvement," with suggested tested devices for advancing departmental quality, economy, and service.

NATIONAL SECURITY AND INDIVIDUAL FREEDOM

By HAROLD D. LASSWELL. A Research Study of the Committee for Economic Development. October, 1950. 259 pages, $3.50

Although the author is Professor of Law at Yale University, his specialized training is as a political scientist and psychologist. In the present volume, the author examines the significance for the fundamental values of a democracy of the conflict, now dominant in the world, between statism and democracy. This study examines the continuing crisis of defense as it may affect these four principles of a free society: civilian supremacy, freedom of information, civil liberties, and a free economy. The need to appraise security measures for their toll of freedom arises from the facts that freedom is at the heart of our society and that individual freedom and a free economy are integral to our economic strength and thus to our national security. The author proposes methods whereby the government and the people would obtain a better grasp of the security program and its bearing on individual freedom, thus contributing to our national unity.

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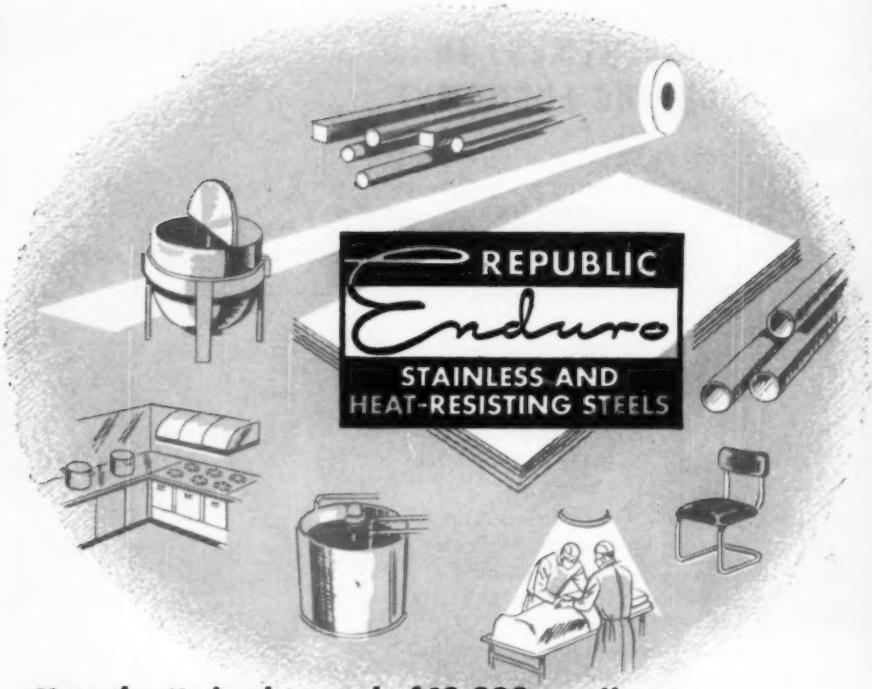

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